THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXXII. No. 9. Whole No. 1,551. | NEW YORK, MONDAY, FEBRUARY 27, 1905. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

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[OFFICIAL NOTICE.]

Twenty-first Annual Meeting of the Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY,
DELAWARE, O., Feb. 14, 1905.

The Twenty-first annual meeting of the Ohio Gas Light Association will be held at Pittsburg, Pa., March 15th, 16th and 17th.

The President, Mr. F. W. Stone, of Ashtabula, O., will call the meeting to order on Wednesday, March 15th, at 9:30 A.M., in Assembly Hall, Hotel Schenley, the headquarters.

The following technical matters will be presented at the meeting:

"Question Box;" edited by Mr. Henry L. Doherty, New York city.
"Progress Department;" edited by Mr. Irvin Butterworth, Grand Rapids, Mich.
"Novelty Advertising and New Business Methods Department;" edited by Mr. B. W. Perkins, South Bend, Ind.
"Wrinkle Department;" edited by Mr. E. E. Eysenbach, Binghamton, N. Y.
"Information Bureau;" edited by Mr. H. L. Olds, Lincoln, Ills.
"Bureau of Forms and Records;" edited by Mr. D. W. Low, Alliance, O.

Reports of Committees.

"Question Box, Revision Board;" Dr. H. B. Harrop, Chairman, Milwaukee, Wis.
"Uniformity of Gas Meters;" Alten S. Miller, Baltimore, Md.; Donald McDonald, Albany, N. Y.; R. Shacklette, Adrian, Mich.
"Standard Sizes for Coke;" C. W. Andrews, Duluth, Minn.
"Uniform System of Mapping Mains;" W. H. Barthold, Grand Rapids, Mich.
"Standard Methods of Testing Fuel Gas Appliances;" Henry L. Doherty, New York city; F. W. Stone, Ashtabula, O.; John Franklin, Cincinnati, O.
"Flow of Gas in Pipes;" J. D. Shattuck, Chester, Pa.; H. A. Carpenter, Pittsburg, Pa.; J. O. Johnston, Columbus, O.
"Standard Methods of Construction and Operation of Coal Gas Benches;" W. A. Baehr, St. Louis, Mo.
"Fuel Economies;" C. H. Williams, Madison, Wis.

Set Papers.

"Removal of Last Traces of Oil and Tar from Water of Condensation;" by Mr. James S. McIlhenny, Washington, D. C.
"Piping Gas Long Distances;" by Mr. W. H. Hammon, Pittsburg, Pa.
"Installation and Care of Exhausters;" by Mr. E. D. Johnson, Connersville, Ind.
"Producer Gas;" by Mr. Edward R. Wood, Jr., Philadelphia, Pa.
"Large Gas Engines;" by Mr. J. R. Bibbins, Pittsburg, Pa.

An opportunity will be given any of the speakers present at the meeting to correct their remarks before leaving Pittsburg, but not after, as all of the reports will be turned over to the printer immediately after the meeting.

The Hotel Schenley is conducted on the European plan, and the following rates have been secured for the meeting: For single room without bath, occupied by one person, $2 per day; single room with bath, occupied by one person, $3 per day; room without bath, occupied by two persons, $3 per day; room with bath, occupied by two persons, $4 per day.

The Schenley is a most modern hotel, pleasantly located at the entrance to Schenley Park, and can be reached by trolley within 15 minutes from all railroad depots. They hope to entertain all of the Association and will put forth every effort to make the members comfortable. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

Pittsburg is one of the most interesting towns in the country for gas men, and the local Entertainment Committee is arranging a programme relative to visiting the different industries. The announcement thereon will be made later. The Secretary will furnish with pleasure application blanks for membership, and any other information which may be desired.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

SMITHSONIAN SEP

BRIEFLY TOLD.

DURING THE BANQUET.—The members of the New England Association of Gas Engineers began to assemble for the 35th banquet about 7 P.M. of the evening set, and 30 minutes thereafter all were ready for an enjoyable time and repast, and such they had. Col. Frank S. Richardson was toastmaster. The toastings were of the hot sort to be expected from those called on by the master, and the edibles were of the quality and delicacy for which "Young's" is noted. The Colonel introduced each of his victims with his usual smooth, but pat, remarks and stories. His first was Mr. E. W. Burdett, of Boston, who, after "knocking" Gen. Schaff a little, gave us his ideas and opinions as to how much of the success of the gas companies depended on their legal associates. He referred to the laws in general relating to gas companies in Massachusetts, and especially to the Gas Commission law and to the Municipal Ownership law, all of which interested us greatly, but which laws it is fair to presume, from the reports of the Board of Gas and Electric Light Commissioners, have been rather strenuous for some of the Massachusetts companies to live up to in a simple way. General Schaff was next introduced to us, and his arising was greeted with the strains of "Marching Through Georgia." The General gave us some sharp criticism, couched in terms to prevent any possibility of offense, coupled with some good, sound advice. The protection of the gas interests by law was gone through with by him, and he advised us that in recognition of such protection we should be fair, just and courteous in all cases, and when called upon to present our records to have them in such shape as to be able to lay them open, without fear and trembling, and say in our own minds "Do your very best." One thing the General referred to which pleased those of the engineering staff, and with which they all agreed, was that the *Engineers* need more pay. No one will dispute this, except perhaps the stockholders. The toastmaster and "Hail to the Chief" introduced Capt. W. E. McKay who, after sparring for time for a few minutes, gave us some anecdotes of the trip across with the Colonel, and succeeded in making the few moments enjoyable to us that he sounded. "Dan." Russell supplied us with several good stories, and then Chief Prichard "rambled" for a while, without doing much colliding, although the Colonel might take exception to this, and gave us one of his best stories. Mr. William McDonald (whose home as everybody knows is not in Louisville Ky.), amused and entertained us with a couple of good stories. It was destined that our elderly bridegroom (Mr. Coggeshall, of the East), was hit pretty hard, but had he been of an age to retaliate no doubt the forgiveness would have been all to the man from Fitchburg. We broke up about 10:30 and each one of the 150 present I think will agree that the evening was one of the pleasantest that was passed by the "bunch" in a long time. Yours, X. Y. Z.

ANNUAL MEETING OF THE WISCONSIN GAS ASSOCIATION.—Our advices respecting the annual meeting of the Wisconsin Gas Association are rather meager, but we may say that the sessions were brought off on the appointed days, in the Hotel Pfister, Milwaukee, under the safe and clever guidance of the President, Col. E. G. Pratt. The attendance was excellent, despite the wintry weather, the technical business was brisk and interesting, and the accessions to membership were many. President Pratt's well-put together address contained many pointed references to the agitation going on regarding the growing demands for the municipal ownership of public utilities, and we hope in the future to give its sentences without abbreviation. The outings numbered visits to the handsome Menomonee Valley plant of the Milwaukee Gas Light Company and to the establishment of the Semet-Solvay Company. The social feature was a banquet in the Milwaukee Athletic Club's handsome hostelry. Col. Pratt was the toastmaster. The officers elected were: President, Col. E. G. Pratt; Vice President, Mr. C. H. Williams; Secretary and Treasurer, Mr. H. H. Hyde. Milwaukee was again named as the next meeting place.

DEATH OF MR. DICKEY.—With much regret we have to report the death of the father of Mr. Charles H. Dickey, whose demise occurred at his home in Baltimore, Md., the morning of the 4th inst. Deceased was born in August, 1832, and his life was one of great activity for almost half a century. His business career was started in 1848 and closed in 1896, the end only coming then because of physical ailments that caused him to undergo several severe surgical operations. Beginning in trading as a boy in a banker's office, he speedily went on to fame and fortune. After the close of the Civil War he engaged in the manufacture of gas meters, with Messrs. Baker & Tansley, and later on founded the Maryland Meter Company. He is survived by his wife and seven children, and it is noteworthy that, married in 1854, his is the first death to occur in the immediate family. He was a man of great probity and of undoubted business talent.

Some Practical Record Sheets.

[A paper read by MR. W. L. WALKER, of Fitchburg, Mass., at the Thirty-fifth Annual Meeting of the New England Association of Gas Engineers.]

Every undertaking should have a definite purpose, whether it be the building of an empire, the inception of a reform, or the writing of a technical, scientific or unclassified paper. My purpose in preparing these notes is certainly not to show how wise I am, but to demonstrate that even the least of us may, by chance, be able to render some slight service to his fellows. Five years ago I first entered the gas business, and a few months later, when I had arrived at a point where I could perceive that there was a difference between gas and air as proper food for the lungs, I confidentially told our mutual friend, Mr. Collins, that I knew quite a little about the business—and was going to know it all. He sadly informed me that if I did I should know more than any of the rest of them. Not being an idiot, I reflected, with the result that I am now permanently kneeling at the feet of Wisdom, striving to really know some few things, but no longer hoping to know all the intricacies of the manufacture, distribution and sale of gas.

In this effort I hope only to be of use to someone who has not, perhaps, had opportunity to arrive at the special facts herein enumerated. The record sheets and cards, to which I call your attention, have to do with the practical work in the manufacturing, distribution and sales departments, and are intended to serve as a guide and basis of estimates to the man in charge of the above departments, rather than to be used in place of the existing bookkeeping in the office.

These records have not been adopted in the order given, but from time to time, as seemed necessary. In fact, so much is this true, that the first-named record was last adopted, and has to do with the retort house.

We have at our works 4 benches of 6's running, 3 in the summer and 4 in the winter. The fact that our holder capacity was limited, established a situation wherein we would fill the holders during the day, and then, for 3 or 4 hours, have several retorts idle. When the load began at night it was necessary to run the benches to the limit. On one occasion we were nearly out of gas, and on several others very close. I formed the opinion that we were not always getting all we could from the retorts, particularly at times when most needed. In other words, the men in charge of the retort house, in deference to long custom, would charge and draw at stated intervals, regardless of immediate needs, or would exercise poor judgment with the same result. While the matter could be controlled in the daytime, it could not in the night. From these circumstances arose two questions: First, the cost of bench fuel; and, second, the faithfulness of the men when the general foreman was away. I had some forms printed, and on July 1st, '04, started bookkeeping in the retort house by the retort men. One sheet is used for each bench each 24 hours, and shows the time the furnace is fired, the amount of coke used in the firing, the time each retort is charged and drawn and weight of coal charged. By this system it is possible to arrive at the amount of coke used for fuel per bench, and also in combining all the retort sheets, and, referring to the manufacturing sheet, get the amount of bench fuel per 1,000 feet of gas. It is certainly interesting and instructive to observe the results with the various makes of gas. I have found 20.6 pounds of coke per 1,000 feet with a make of 198,000 feet, and 32.8 pounds per 1,000 feet with a make of 114,000. As the coke is fed to the furnace hot we do not, of course, weigh it, but we do weigh all the separate charges of coal placed in each bottom retort of every bench. We then assume the weight of the coke to be 65 per cent. of the weight of the coal, and repeated tests have shown this figure to be correct on an average. These figures, then, serve to corroborate the fact that economy is to be had in running benches to their safe limit.

Another point in regard to these retort house records is that we are able to keep a constant check upon the men to the end that every retort shall be working, provided there is holder room for the gas. Thus we find that number 4 retort, in bench number 2, was charged at 8 A.M., and was drawn at 3 P.M.; an excessive length of time for carbonizing 350 pounds of coal. Inquiry is made why the retort ran 7 hours instead of 4½ or 5. We are told that the retort was shut off at 1 P.M., not drawn, and forgotten, or purposely left as not being necessary to recharge. This very thing nearly run us out of gas on one occasion. In brief, the opportunity is given to watch each retort every 24 hours by means of these daily records, and to analyze and set right things which seem wrong. Every fire is cleaned every morning, and the ashes carried out every day. The flues are also inspected daily, and

every effort made to make the retort house efficient in its workings, and the results placed on record.

It was thought that cleaning the fire every morning would result in a loss by letting down the heat every day, but it proved otherwise. When cleaning the fire every other day we used 25 to 27 per cent. of coke made as a fuel on a maximum make of gas. Now, when cleaned every day, we use only 19 to 20 per cent.

I have been glad to observe that the retort men make use of the records, in that they depend upon them to ascertain when it is nearly time to draw any given retort. Of course they are tested before drawing, but the danger of allowing thom to run overtime is eliminated.

The next sheet for consideration is the general manufacturing account. This is a weekly sheet and differs, probably in a few details, from those in general use at your various works. It shows coal carbonized, state of station meter, height of holders, steam fuel for electric station, both coal and coke; oxygen, oil, gas made and consumed per 24 hours, fuel gas, weather, benches and purifiers. There is also a detachable coupon, or slip, for cash and credit sales of tar and coke, which is passed in to the cashier weekly, with the money received. This form is copied into the regular gas book.

I found that a definite time sheet was desirable, both for the works and for the street men, and designed one to fill the double purpose. The sheets are daily, and so ruled on one side as to show the name and total time for each man, and also how that time is divided between repair work, purifiers, gas coal, steam coal, retorts, stoves, meters, fixtures, new mains, repair mains, supplies and labor charged to electric station. The total of these various headings will equal the sum of each man's total time.

One-half the other side of the sheet is ruled for data on supplies, giving name, size pipe, distance main to street line, distance street line to meter, size street ell, size service cock and labor. This gives accurate basis to make charge for supplies in all cases where supplies are not free, and also data for giving estimates of cost for any proposed supply. The balance of this side of the time sheet is devoted to data for new mains, showing street, size of main, amount laid, gates, drips and labor. It will be noted that the labor on supplies and mains agrees with the total time shown for these headings on first page.

Next comes a card for sale of gas stoves. This was the first card system I introduced at our office, and it early proved its value. The card shows date of year, street and number, name of customer, owner or tenant, supply or not, stove or not, date of sale of stove, kind of stove, price and terms, when set up and by whom, date of call upon prospective customer, and the result. A portion of the card is ruled to enter credits of whole or partial payments.

This card I designed primarily for canvassing, but also to be used as a record for every stove sale, whether solicited or not. We have used these since 1899, and they have proved to be one of our best records, giving an individual account of every stove, customer and all details. During one year, in collecting data for advertising they served every purpose. In this connection I have an exhibit of advertising touching very practical matters, and our consumers herein testified to all the points of excellence in a gas stove, such testimouy being most convincing.

In 1902 we took up the fixture business and were quite anxious to know how we stood on these accounts. As there is much detail to it I concluded that a system of cards would be just the thing. Our fixture card shows on one side date when sold, name of customer, owner of house, street and number, description of building, a supply or not, date of putting in supply, house piped or not, when piped, number of outlets, pipers, fixtures, globes and lamps. It is also ruled for full or partial payments. The reverse side of the card is ruled to enter cost of different sizes of pipe, fittings, fixtures and labor. These records tell us very accurately the amount we have made or lost upon any job of house piping.

Our entrance into the fixture and piping business soon drove the plumbers and steamfitters from the field. They do occasionally put in a job of house piping, but nearly always in a new house where they take the contract for plumbing, heating and gas piping.

We have found it advisable and even necessary to insist that every job of gas piping done by anyone shall be submitted to us for inspection. Previous to the adoption of the plan there were cases where leaks would develop, and, of course, a demand was immediately made upon the gas company that they at once send a man to stop the gas from leaking. It was desirable to place the responsibility and expense where such belonged, and, therefore, we presented certain regulations to all pipers and contractors which must be observed. These regulations refer principally to the size of pipe and the test for tightness. We view every job subjected to 10 pounds air pressure. I thought this matter of sufficient importance to give it a system record, and to that end had some cards printed, showing date of year, street and number, name, building, number of risers, stove outlets, number of outlets, size meter required, size supply needed, name of pipers, kind of test, date of test and result. We keep this record on all piping done by ourselves as well as others, and the value of the record as a ready source of information I trust is obvious.

I have here blank forms of all the records named, and shall be very glad if any member of the Association cares to inspect them later. The subject of this paper is commonplace and the presenting faulty, but I have written and read it for three reasons: First, I felt sure that someone would get some good from some portion of it; second, I promised the Secretary to do something; and third, I would not be counted a useless member of the society.

The Development of Purifying Plant, with Jager Grids in View.

[By Mr. John C. Belton, Engineer and Manager, Chester Gas Works, in *Journal of Gas Lighting*.]

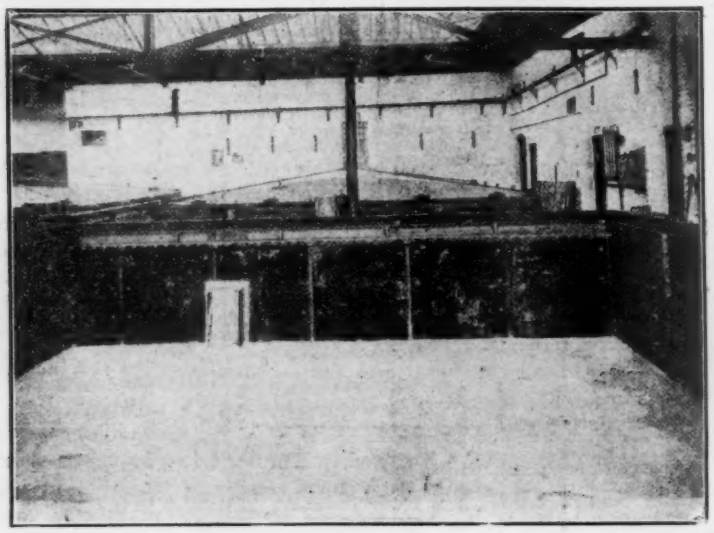
The problem of securing an increase of purifying efficiency, without undesirable capital expenditure, has troubled many an anxious engineer when the stress of a heavy season has made all too apparent the inability of his purifiers to cope with the ever-growing demands upon their capacity.

The advent of the Jäger system of filling purifiers marks the dawn of a brighter day for those who are thus worried; for not only does it render possible the obtaining of greatly increased duty from existing plant, but promises also a not inconsiderable reduction of the ordinary labor charges on purification account. And, moreover, it offers to do this for a moiety of the cost which would have to be incurred if relief were sought by adopting the alternative of putting down purifiers of greater area than those which have become too small for growing needs.

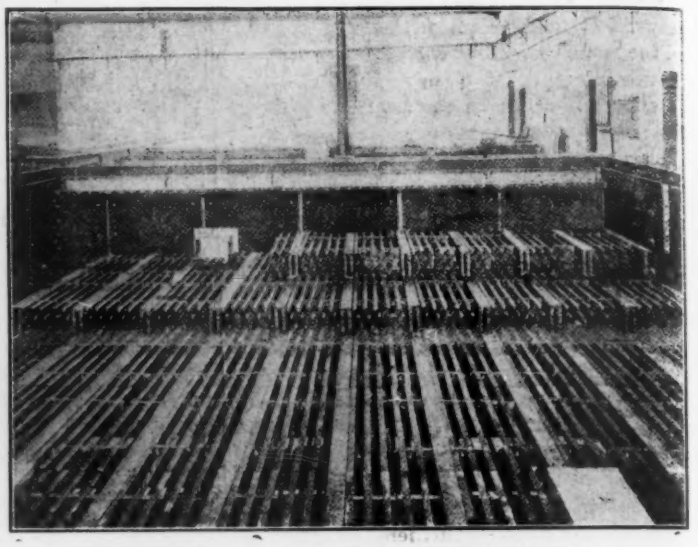
A brief account of six months' experience with the "Jäger" grids may be of interest to readers of the "*Journal*" who are faced by the necessity to do something in the way of increasing their purifying plant; and it is with a view to assist such, and not for controversial ends, that I venture to publish the results obtained at the Chester Gas Works.

The oxide purifiers here are four in number, each 24 feet by 22 feet by 5 feet. Taking Newbigging's well known rule as the standard of area required, it will be seen that these are equal to a daily make of 870,000 cubic feet, or 36,250 cubic feet per hour; and the natural result of increasing their duty to 45,000 cubic feet per hour was such an increase of back pressure as to necessitate a considerable decrease in the thickness of the layers of material, in order to avoid frequent blowing of the lutes, with the further sequence of more rapid fouling, more frequent changing, and, of course, heavier labor charges. It was in the hope of obtaining relief from these conditions, and obviating the necessity for pnrifiers of larger capacity, that it was decided to give the Jäger system a trial. The results have fully justified the adoption of that course.

One purifier only, No. 3 in the set, was dealt with in the first instance. The necessary alteration of the interior fittings having been completed, the box was filled on June 14, and remained in action until Sept 9. It would, in the ordinary course of things, have remained until Sept. 25, as the purifier next but one preceding it did not foul until that date. But for reasons of convenience, it was put out of series on the earlier date. The day after the purifier was put in action, No. 4 was changed for the purpose of fixing a new curb. Ten days later No. 1 was changed for a similar purpose. No. 2 thus became the inlet or foul purifier only 11 days after No. 3 was put on. The average run of the ordinary purifiers in summer is about 29,000,000 cubic feet. At the time No. 1 was prematurely put out of action, it had passed only 17,500,000 cubic feet, and had still a life of about 11,000,000 cubic feet to its credit .The fouling of No. 3 was thus accelerated by that amount; and this has to be taken into account in calculating the duty obtained from it on the first run with Jäger grids; and the total duty obtained is thus arrived at: Gas passed during run June 14 to Sept. 9, 37,092,000 cubic feet; Sept. 9 to 25 (when No. 1 fouled), 8,124,000 cubic feet; allowance for acceleration by premature changing of No. 4 and No. 1, as stated above, 10,679,000 cubic feet—total, 55,895,000 cubic feet. This is an increase of nearly 27,000,000 cubic feet, or 92 per cent. over the summer duty obtained under the ordinary system. The material used was Irish bog ore, containing 21 per cent. of sulphur (wet basis), and the sulphur taken up on the run I have been referring to was 11.9 per cent. (wet basis).



Purifier at the Chester Gas Works Emptied (Showing the new Distributing Chamber) and Ready to Receive the Grids and Conduits.



The Same Purifier with Half the Grids and Conduits in Position.

These results were considered sufficiently satisfactory to justify an extension of the system. But the approach of the busy season only allowed of the conversion of one more purifier in the series; and No. 4 was accordingly taken in hand, and was filled and put in action on Nov. 10. No. 3 was refilled, and put in action on Sept. 10, and came off on Dec. 9, having passed 62,623,000 cubic feet of gas. The material used in this second run of No. 3 was new artificial oxide from Read Holliday and Co.; and the sulphur taken up during the three months' run was 10.5 per cent.

Comparing these figures with the average "all-the-year-round" duty obtained by the ordinary system, there is an increased duty of 38,500,000

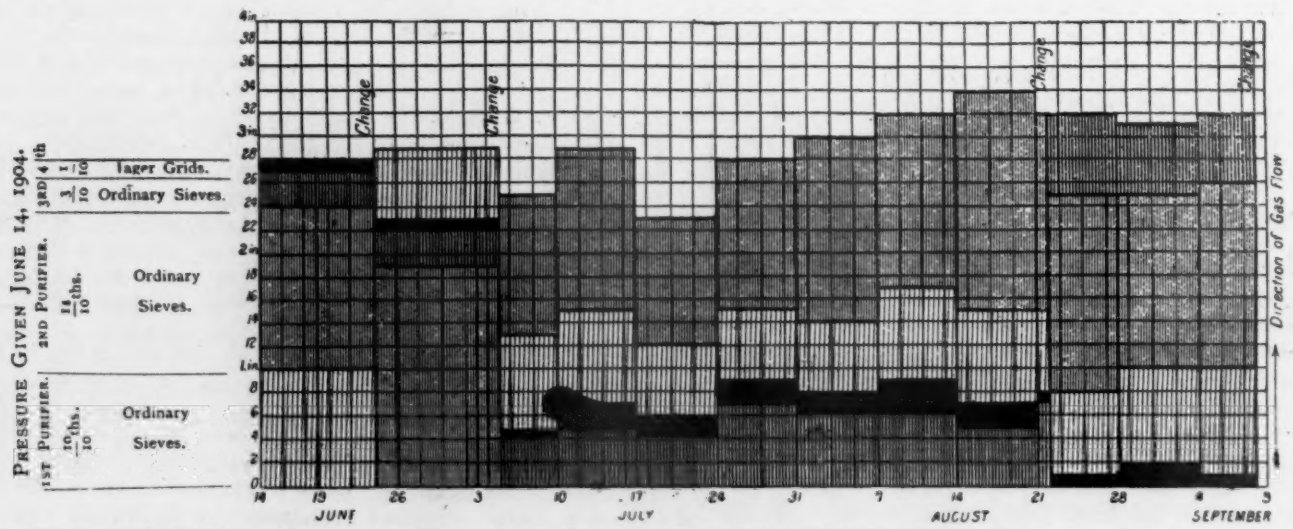


Diagram Showing the Relative Pressures Given by One Purifier on the Jager System, and Three Working with Ordinary Sieves. Dimensions of Purifier Fitted: 24 Feet by 22 Feet by 5¼ Feet Deep.

(*Note.*—Extent of pressure given by purifier fitted with Jager Grids shown thus ▬▬.)

Comparative Statement of the Working of Four Purifiers Fitted with Ordinary Sieves, and when One or Two of these Purifiers are Fitted with Jäger Grids.

		Contact Surface.		Comparative Speed of Gas in Feet per Second. (Max Make.)	Mass of Oxide.		Gas Passed per Change.		Cube of Purifier Used Per Cent.	Sulphur Taken Up.			Pressure Given per Purifier. Tenths.	Remarks.
		Total Square Feet.	Square Ft. per 1,000 Cu Ft. of Gas. Max. Make pr. Diem.		In One Box Tons.	In Four Boxes Tons.	Total Cubic Feet.	Cubic Feet per Ton of Oxide in Four Boxes.		In. Per Cent.	Out. Per Cent.	Taken Up. Per Cent.		
Summer Working. April–Sept.	Jäger Grids,	955	....	.....	50½	176½	55,895,000	316,685	71.8	21	32.9	11.9	2	
	Ordinary Sieves.	524	....	.....	42	....	29,000,000	172,619	60.0	...	....	....	6	During this test (June 14 to Sept. 9), one purifier out of the four was fitted with Jäger Grids.
	Increase.	431	...	.....	8½	....	26,895,000	144,066	11 8	..	....	...	4	
	Increase per cent.	82 p.c.	....	.....	20.23 p.c.	....	92.7 p.c.	83.4 p.c.	20.0	....	....	....	66 p.c. Reduction.	
Winter Working. Oct.–March.	Jäger Grids,	955	0.888	0.0130	50½	157	35,733,000	227,598	71.8	32.9	45.6	12.7	2	
	Ordinary Sieves.	524	0.480	0.023	28	....	19,000,000	170,000	40.0	....	....	....	15	During this test (Nov. 10 to Dec. 21), two purifiers out of the four were fitted with Jäger Grids.
	Increase.	431	0.408	0.010 Reduced speed	22½	....	16,733,000	57,598	31.8	....	....	....	13	
	Increase per cent.	82 p.c.	85 p.c.	43.47 p.c. Reduced speed	80.35 p.c.	....	88 p.c.	33.8 p.c.	79 5	....	....	....	86 p.c. Reduction.	

cubic fect equivalent to 160 per cent., and compared with the highest previous record, which was an extraordinary one, the increased duty is 24.81 per cent. No.4 purifier which was filled on Nov. 10 came "off" on Dec. 21, having passed 35,733,000 cubic feet—a very high duty for the time of year, and an increased duty of 88 per cent. above the winter average. The material used was partly spent Irish bog ore taken from No. 3 on Sept. 9, and containing 32.9 per cent. of sulphur. It now contained 45.6 per cent. of sulphur, having taken up 12.7 per cent. during the run.

But the most remarkable feature of these trials remains to be considered. Every care was taken in filling the purifiers to insure that the material formed an unbroken mass from top to bottom of the box, between the conduits; and careful observation when emptying the purifiers showed that this had been successfully obtained. The thickness of the vertical walls of material between the conduits is 1 foot 9½ inches. In the ordinary system, the horizontal layers of material are each 1 foot 6 inches in summer, and 1 foot in winter, and the pressure thrown by the boxes is generally from 6-tenths to 3 inches each, though this has been occasionally exceeded. The highest pressure thrown by either of the two Jäger purifiers has been 4-tenths; but it has very seldom exceeded 1-10th, and has not averaged 2-tenths. Consequently, we have had no blowing of lutes since these grids were introduced; and I need hardly point out the correlative advantages of reduced load upon the exhauster.

The table appended shows the results obtained in comparison with the summer and winter averages of the ordinary system; but it must be borne in mind that these results are arrived at with "mixed" purifiers —*i. e.*, one Jäger and three ordinary for summer, and two Jäger and two ordinary for winter; and the advantages obtained by the Jäger system are therefore minimized. They may be summarized as follows:

Increase of contact surface 82 per cent.
Increase of purifying mass (during winter) 80 per cent.
Pressure reduced to 2-tenths.
Speed of gas through the purifying material reduced 43½ per cent. or nearly one-half.

The ease with which the grids are manipulated and the absolute regularity of the density of the material between the conduits are advantages which must be seen to be appreciated. Of the relative labor costs of the two systems, I am unable to give definite figures at present; but that there will be a saving in this direction, I feel assured, as I am also that the Jäger grid system of purification is an immense step in advance of anything which has so far apppeared.

An Improved Gas Testing Apparatus.

[By Mr. J. E. Babb, in *Jour. Am. Chem. Soc.*]

The drawing and photograph represent some new features of the Orsat apparatus; in general design it is quite similar to the usual form.

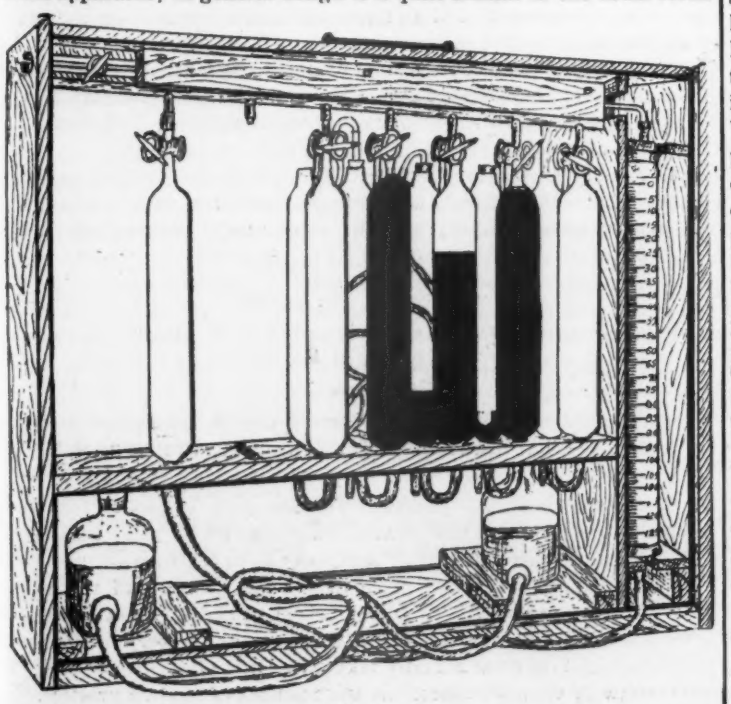


Fig. 1.

For purposes of making a greater number of determinations and with a greater variety of gases six absorption tubes are employed, these being large enough to accommodate 250 cc. of absorbent solution in each tube, and an explosion tube is included.

The box is made to contain, besides the tubes, two dry cell batteries, one induction coil, an oxygen tank, and two leveling bottles—one for water to confine gases, and one for mercury to confine gases for explosion. This necessarily makes the apparatus large, but at this it is only the size of an ordinary dress suit case.

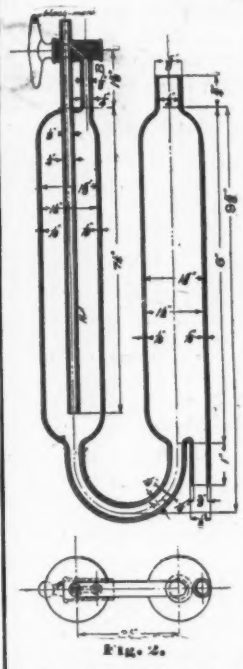


Fig. 2.

The principal feature of the apparatus is the bubble tube shown in Fig. 2. It consists of two large tubes, back and front. The front tube consists of a capillary tube *A*, placed inside of the large tube and connected with a 3-way cock and at the top of the large tube.

In use, the 3-way cock is engaged only with the capillary tube *A*. The gases then bubble through the absorbent solution. To return the gases to the measuring burette the 3-way cock is engaged with both the capillary tube *A* and the exit tube *B*. The gas passes out through *B*, the solution rising up in the large tube and capillary tube *A* at the same level, the analysis being otherwise conducted as in the Orsat.

By bubbling the gas through the absorbent solutions in this manner a more rapid and complete absorption of gases is obtained, and this is superior to absorptions by contact and shaking, one passage of the gases being sufficient for complete absorption.

A rapid analysis for gases for gas engine control can thus be made in 12 to 15 minutes, including analysis for carbon dioxide, oxygen, carbon monoxide, hydrogen and methane, and ethylene.

The idea of bubbling the gas through the solutions has been suggested by many, and has been applied, but not in so convenient a manner.

The Lomax Improved Method of Purifying "Peculiar" Illuminating Gas.

On the 14th inst. United States Letters Patent No. 782,403 were granted to Mr. Clarence S. Lomax, of Everett, Mass., for an improved method of purifying illuminating gas. Using the words of the specification: In the manufacture of illuminating gas from coals containing a high percentage of sulphur a number of sulphur compounds are found to be present in the product which are objectionable in illuminating gas by reason of the fact that when the gas is burned sulphur compounds are formed which not only have an offensive smell, but are positively harmful to animal and plant life. In many places it is required by law that all sulphureted hydrogen must be removed from the gas and that the amount of sulphur contained in other compounds remaining in the gas must be reduced to less than 20 grains per 100 cubic feet. While the removal of sulphureted hydrogen is a comparatively inexpensive step in the purification of gas, the removal of other sulphur compounds, of which six-sevenths to seven-eighths consist of carbon disulphide, has in the past been a highly expensive operation. The principal method heretofore employed for this purpose has been what is known as the "lime" method. In order to remove carbon disulphide by the lime method, it was first necessary to remove the carbonic acid from the gas, which was performed by passing the gas through hydrated lime. The gas was then passed through sulphided lime, which absorbed carbon disulphide to a greater or less extent, depending upon the rapidity with which the gas passed through the absorbing material and the amount of surface exposed. Thereafter the sulphureted hydrogen was removed by passing the gas through an "iron sponge" of ferric hydroxide or similar absorbent. The objections to this method not only involve the very considerable expense incident thereto, but the intensely disgusting and widely disseminated odor of the spent lime, the wear and tear on the purifying plant, and the labor involved in the removal and replacement of the lime.

In the removal of the carbon disulphide—that is, the principal organic sulphur compound—from illuminating gas it has been proposed to make use of the reaction between carbon disulphide amines by employing an amine, such an aniline dissolved in alcohol or oil as a washing material for washing the gas. The employment of this method of

washing carbon disulphide from illuminating gas even if it were used in connection with powered sulphur as a catalytic or contact substance, as has also been suggested, would necessarily involve elaborate and expensive scrubbers for the reaction, which would not only absorb illuminants from the gas, and therefore, necessitate further carbureting of the gas for the restoration of the lost illuminants, but the size of the scrubbers would have to be so great in order to afford sufficient contact between the gas and the reagents as to make the apparatus required very large and costly. This method would also involve considerable expense for attendance and motive power. Moreover, it is to be observed that the powdered sulphur would afford a relatively small contact surface by reason of the fact that with relation to the surfaces exposed and capable affording reaction the area of the sulphur particles would be small. This would reduce the speed of the reaction. Furthermore, it would be necessary to install and maintaiu purifying plants and pumps for clarifying the exhausted solutions from the scrubbers by removing the sulpho-carb anilide deposited in the solutions, as well as to maintain stills and furnaces for the redistillation of the solvent oils in order to revivify them for further use. This method, as far as known to the present applicant, has never been successfully used on a commercial scale, owing to the objections of the enormous expense incident to the installation and maintenance of the plant.

The object of the present invention is to produce an improved method of purifying illuminating gas. It contemplates the removal of carbon disulphide in a cheap and economical manner, preferably with existing apparatus and with the aid of inexpensive materials. According to the present invention the reaction between carbon disulphide and amines is availed of to remove the carbon disulphide from the illuminating gas, and perhaps the most important feature of the present invention is the discovery by me that this reaction may be carried out on a commercial scale by chemically divided sulphur as the catalytic or contact substance.

The present method of purifying illuminating gas consists in the removal of carbon disulphide by the use of the carbon disulphide and amine reaction in the presence of chemically divided sulphur. The gas from the generators or retorts, after having been cooled and scrubbed free of its contents of tar and ammonia, is passed through a purifying box, such as is ordinarily used in the gas works, which is chemically divided sulphur impregnated with an amine. The preferred form in which the sulphur is used is in the iron sponge which is used for removing sulphureted hydrogen from gas. It is to be remarked that the invention also contemplates the use of bog iron ore, Weldon mud, Lux's mass, Laming's mass, spent lime, or the mixtures of these materials with wood shavings, sawdust, coke, braise, and other materials used for increasing the porosity of the material, which materials have been commonly used for the removal of sulphureted hydrogen from gas and are therefore after use rich in free, chemically divided sulphur. As is well known, the removal of sulphureted hydrogen from gas is accomplished by the use of ferric hydroxide in a purifying box through which the gas is passed. The ferric hydroxide reacts with the sulphureted hydrogen to form iron sulphide and water. This sulphide of iron is revivified for repeated use by oxidation by exposure to the air or oxygen, which transforms the sulphide into free chemically divided sulphur and ferric oxide or hydroxide. The iron sponge is used over and over again with revivifications between until it is useless for further removal of sulphureted hydrogen, and at this time this material, known as "spent oxide," is heavily charged with finely divided free sulphur which exists in a chemically divided state, as much as 40 to 60 per cent. of the spent oxide being free sulphur. By reason of the fact that this spent oxide is composed so largely of sulphur and the sulphur is in such a finely divided state it exposes an enormous surface of sulphur and is the best catalytic substance for use in the present method of which the applicant is aware. Of course it is to be understood that the present invention is not limited to the use of spent oxide as the catalytic or contact substance of the reaction; but the invention contemplates in its broader aspects any form of chemically divided sulphur which the user may desire to employ. The purifying box, therefore, is preferably filled with the spent oxide, which is impregnated with an amine or amines, preferably commercial aniline, which in the presence of the sulphur reacts vigorously with the carbon disulphide contained in the gas passing through it to form sulfo-carb anilide and sulphureted hydrogen, the reaction being as follows:

$$2C_6H_5NH_2 + CS_2 + S = CS(C_6H_5NH)_2 + H_2S + S.$$

It is to be noted that the sulphur which is included in the reaction enters only as a catalytic [or contact] substance and is not affected by the reaction which it promotes. If desired, the aniline used for impregnating the spent oxide may be mixed with a suitable neutral solvent or diluent in order to form a vehicle for spreading the same over the surface of the sulphur. When this purifier containing spent oxide and aniline has been used until the aniline is exhausted by the reaction, the purifying box is put out of operation and the exhausted material replaced with spent oxide freshly impregnated with aniline. The material is deprived by the reaction of its aniline only, and in order to prepare it for further use it is only necessary to again impregnate it with the aniline solution, when it is ready for further use. The same spent oxide may be used many times. After the gas has been deprived of its carbon disulphide in the purifying box in the manner just referred to it is passed through an ordinary purifying box or boxes containing ferric hydroxide or other material for the removal of sulphureted hydrogen, after which the gas may be conveyed to the meters and gasholders.

It will be observed that the present method renders unnecessary the removal of the carbonic acid from the gas, eliminating an expensive step which is necessary in the lime method for the removal of carbon disulphide. The reaction of the carbon disulphide with the aniline in the presence of such a great sulphur surface is so vigorous and rapid that in practice it will be necessary, in order to reduce the amount of organic sulphur compounds in the gas below the permissible or hygienic limit, to pass only part of the gas through the sulphur aniline purifying box, the remainder of the gas being permitted to pass by and be mixed with the gas from the sulphur aniline purifying box, which mixture shall contain only the permissible amount of sulphur in compounds other than sulphureted hydrogen. This is a feature of the present invention of considerable practical value, as it materially diminishes the volume of gas necessary to be treated by the process and at the same time produces a product sufficiently free from organic sulphur compounds.

This process as preferably carried on is a dry process and not a wet process. This is an important feature of the invention and commends it over prior attempts to employ the amine reaction by reason of the elimination of specially designed and expensive scrubbers for washing the gas and recarbureting of the gas for the restoration of lost illuminants, as hereinbefore suggested, and by reason of other attendant advantages apparent to those skilled in the art.

Having thus described the invention, what is claimed is:

1. The method of purifying illuminating gas, which consists in exposing it to an amine or amines in the presence of metallic oxides impregnated with chemically divided sulphur, substantially as described.

2. The method of purifying illuminating gas, which consists in exposing it to aniline in the presence of metallic oxides impregnated with chemically divided sulphur, substantially as described.

3. The method of purifying illuminating gas, which consists in exposing it to aniline mixed with a diluent in the presence of metallic oxides impregnated with chemically divided sulphur, substantially as described.

4. The dry process of purifying illuminating gas, which consists in exposing it to the action of an amine or amines spread over the surface of chemically divided sulphur, substantially as described.

5. The dry process of purifying illuminating gas, which consists in exposing it to an amine or amines spread over the surface of metallic oxides impregnated with chemically divided sulphur, substantially as described.

6. The dry process of purifying illuminating gas, which consists in exposing it to the action of aniline spread over the surface of a spongy mass of chemically divided sulphur, substantially as described.

[Concluded from Page 289.]

Fundamental Principles Involved in Blast Furnace Practice.

[Read at a stated meeting of the Mining and Metallurgical Section of the Franklin Institute, by MR. EDWARD A. UEHLING, M.E., New York.]

Chemical Reactions.—Practical furnace men are, as a rule, very much in the dark as to the chemical reactions which take place inside of the blast furnace. Accurate data, both as to the temperatures existing and changes which take place in the various zones of the modern blast furnace, are entirely wanting. Such an investigation as was carried out by Sir Lowthian Bell nearly 40 years ago is very badly needed to throw light on what actually takes place in a blast furnace under the so materially changed conditions and methods of modern practice.

Every blast furnace manager knows, of course, the nature and composition of the raw material charge at the top, and the physical condition and chemical composition of product tapped out at the bottom, and can and should know the composition of the escaping gases. And all this indicates to him more or less clearly what is actually going on inside of the furnace. But in reality all he knows with certainty is the beginning and the end. We know that all the carbon that reaches the tuyeres is burned to CO, and that this reaction is the principal source of heat by which the process of smelting is carried on, and that the CO is the all-important reducing agent.

From the composition and temperature of the escaping gases we can make inference as to the relative efficiency of the furnace at the time. From the appearance and chemical composition of slag and iron we can tell whether the furnace is in good or bad working condition, but of the actual chemical reactions taking place in the interior of the furnace, either as to their sequence or relative importance, we know practically nothing.

Carbon impregnation is one of the important phenomena about which we are still very much in the dark. It had been observed before, but was first prominently brought before the iron metallurgists through the researches of Sir Lowthian Bell, that sesqui oxide of iron (Fe_2O_3) possessed the property of splitting up CO into $C + CO_2$ at temperatures existing in the upper region of a blast furnace. This phenomenon has recently been the subject of scientific investigation and is very ably discussed in *Stahl und Eisen*, No. 21, 1904, by Dr. Aloys Weiskopf.

All hematite ores possess this quality to a greater or lesser degree and some of these from the Mesabi range are most remarkable for their capacity to become impregnated with carbon.

Experiments conducted by Mr. O. O. Landig[1] showed that the ore of some of the deposits became impregnated to such an extent that their volume was very considerably increased. This being so, it is more than probable that most of the difficulties experienced in smelting the Mesabi ore are due to the quality of excessive carbon impregnation.

Hanging of the Stock in the upper part of the furnace is, no doubt, entirely due to this phenomena, for it necessarily follows that the swelling of the ore must increase the resistance to the gas currents and must also increase the friction against the inwall of the furnace. Now if we consider that even under the most favorable conditions, by far the greater part of the column of stock is supported by the normal friction against the inwall, and the further fact that 1 pound of unbalanced gas pressure will sustain approximately 1 foot in height of the column of stock, it is not difficult to understand how the downward movement of the solid material may be arrested without involving any other factor than excessive carbon impregnation.

A portion of the stock column having once come to rest, it is bound to remain at rest until the cause of arrest is removed. This necessarily follows from the fact that friction of rest is greater than friction of motion, so that if there is sufficient friction and pressure developed to cause a moving body to come to rest, there is always more than necessary to hold it stationary. Meanwhile, the consumption of fuel continues at the tuyeres in accordance with the volume of oxygen forced in by the blast. The iron sponge is carburized and melted, the dross of both ore and fuel combines with the flux and is fused into a liquid slag which descends with the iron into the hearth, where they take up very little space compared with their original bulk, and from which they are tapped off from time to time. As this process of smelting goes on, that portion of the column of solid material which is free to move in the furnace shaft above continues to descend. This causes a break between the arrested and moving part of the stock column. A cavity is soon formed which continues to increase in dimension in proportion as the moving column is smelted and consumed. The shorter this column gets, the less is the resistance it offers to the ascending gases, hence, with a given blast pressure, the pressure in the cavity must also increase, thus giving the stationary column still greater support.

Slipping.—On the other hand, it is evident that since no cold stock enters the furnace during the period of hanging, its contents must become hotter and hotter; also that the increased temperature will accelerate chemical reaction. Reduction progresses more rapidly; the carbon deposited at the lower temperature is consumed by the oxygen, liberated from the ore which it had impregnated, or by reducing CO_2 to CO, probably both. As this process proceeds, the stationary column necessarily shrinks, gradually loses its hold on the wall, and finally breaks away. This phenomenon is called a slip or slipping.

There are two distinct varieties of this phenomenon, the one due to causes just discussed known as top slips, always occurring in the upper half of the stock column; and the other, called bottom slips, to which I shall recur later, due to causes entirely different and always occurring in the lower part of the furnace, generally within the limits of the hearth and bosh.

To have a furnace slipping is always unpleasant. It is frequently serious and on several occasions resulted very disastrously.[1]

Prior to the introduction of the Mesabi ores, top slips were of very rare occurrence, and when they did occur were of a comparatively mild form, but no sooner had these ores become an appreciable part of the ore mixture than these phenomena of slipping became more and more frequent and very often manifested themselves with such force that "explosion" seemed to be a more appropriate term than "slip," and hence the phenomena is generally referred to as "Mesabi ore explosions."

When we consider that the dislocation of the charging hopper and top plates was an every-day occurrence and that on several occasions the whole charging apparatus, weighing many tons, was blown clean off the furnace and large quantities of stock were scattered broadcast, it appears quite natural that the explosion hypotheses should have seemed necessary to explain the effect produced.

On the other hand, a little calculation will show that the force necessary to throw a bell and hopper out of a furnace is not so great as would appear from the mere statement of the fact that they weigh many tons. A gas pressure of 1 pound per square inch, when applied to a circular area 12 feet in diameter, exerts a lifting force of considerably over 8 net tons, and on an area of 14 feet in diameter of fully 11 net tons. This is quite sufficient to lift the average bell and hopper out of place.

What pressure of gas is produced by a top slip depends on the size and the shape of the cavity developed during hanging, as well as the temperature and pressure of the gas it contains, the weight of the suspended column, and the manner in which it drops. There being no means of making direct observation, we can only reason from effect to cause, and the severity of the former has given rise to the assumption that the latter must be some form of explosion. Whether this view is tenable or not depends entirely on how broadly we define the term "explosion." In reality it matters little by what name we call it so long as it does not lead us to a wrong conception of the phenomena of which we are endeavoring to get a clear idea and find an adequate and rational explanation.

Let us suppose that the upper 10 feet of the stock in a modern blast furnace become arrested, *i. e.*, hang. The furnace working normally below, a cavity will at once begin to form, and will increase as fast as the descending column is consumed at the lower end by the process of combustion and smelting. As the descending column shortens, the resistance to the ascending gases through it becomes less, and since the condition of the hanging column is but slowly changing, the gas pressure in the cavity steadily increases. The same is necessarily true of the temperature since the gas passes through material which is getting hotter and hotter as it approaches the zone of fusion. While the increased pressure tends to support the hanging column indefinitely, the increased temperature stimulates chemical action referred to above, and the deposited carbon is gradually consumed. This burning out of the impregnated carbon causes shrinkage of the suspended material and finally results in its dropping or slipping into the cavity below.

It does not require any very considerable stretch of the imagination to suppose that the hanging column, which we assumed to be 10 feet high, to drop like a practically solid plunger into a cavity below 10 or 15 feet deep. This cavity being filled with highly heated gas already under considerable pressure, the necessary immediate effect would most likely be as follows: The hot gas below will be compressed proportional to the weight and momentum of the descending mass, and the partial vacuum formed above will be filled by cooler gas rushing back into the furnace from the gas mains, mingled with more or less atmospheric air drawn in through the leaky bell and poorly fitted explosion doors. Immediately the pressure of the compressed gas is sufficient to overcome the resistance offered by the plunging stock column, it breaks through with force and instantly mixes with the cooler gases above, raising them suddenly to a high temperature, which later may be very materially augmented by the instantaneous combustion of the oxygen present, resulting in a pressure sufficiently sudden and high to produce effects akin to real explosions. The author is not aware that the pressures of these so-called "explosions" have ever been measured, but it

1. Transactions of American Institute Mining Engineers, Vol. XXVI., "Action of Blast Furnace Gas on Various Iron Ores."

1. It will be remembered that Captain Jones lost his life by being enveloped in white hot coke, slag and molten iron, bursting forth from one of the Edgar Thompson furnaces in consequence of a bottom slip, and that Ed. Reisse was burned to death by the hot stock thrown from a furnace in his charge at New Castle, Pa., due to a top slip.

is doubtful whether they often exceed 10 or ever reach 15 pounds per square inch. The lesser of these pressures would be quite sufficient to throw any bell and hopper not securely fastened down, clean out of the furnace.

It must not be supposed that top slips always take place in the extreme manner of our hypothetical case just described. Generally the hanging stock drops into the cavity below less suddenly, the phenomena lasting over many seconds and sometimes minutes; nevertheless, considerable quantities of fine ore and coke are thrown out with every slip, and not infrequently large quantities of the coarser material, especially coke, as well. The large furnaces, working principally on Mesabi ore, apparently work by slips only. It is the exception rather than the rule that 24 hours pass without appreciable slipping. The quantities of coke and ore that are frequently blown out through the explosion doors and scattered over the premises are appalling. There is one feature about these phenomena which, since their destructive effects have been overcome by structural improvements, makes them less objectionable than would at first appear. The real process of smelting is but very little, if at all, disturbed by them. If it were not for this fact, top slipping would have become intolerable long ago. As it is, large output and acceptable quality are still attainable.

In the light of our present knowledge, top hanging and slipping seems to be attributable to two causes: First, the inherent condition of the ore, and, second, over-exposure. The first can be mitigated by judicious selection and admixture of the ores and proper charging, and the second cause can be largely if not altogether avoided by smelting these ores in furnaces better adapted to their requirements. The modern excessively high furnace is an absurdity when we consider reducibility and other properties, both physical and chemical, of the ores smelted in the majority of them.

Bottom Slipping.—Bottom slipping is a phenomenon quite different from top slipping, and it is due to entirely different causes. Bottom slipping occurs entirely within the zone of fusion and is chiefly caused by temperature variations in the blast temperature variations due to direct variations in the blast temperature, the irregular moisture content, and to changes in the carbon content in the fuel. Irregularity in the composition of the slag aggravated by temperature changes is probably the most prolific cause of hanging and slipping in the lower part of the furnace. Excessively basic slags are more inclined to build up than acid slags. High alumina slags are especially bad. Bottom slips invariably spoil one or more casts of iron, and not infrequently block up the hearth and tuyeres to such an extent with a cold refractory conglomerate of partially reduced iron, slag, carbon dust, lime, and fine coke, that heroic means are required to get the furnace into proper shape again. Not more than a generation ago bottom slips very often proved fatal to the campaign, or at least required days of sledging and drilling to get the blast properly into the furnace and the molten iron and slag away from it. The introduction of the oil blowpipe proved itself of great assistance to the troubled furnace manager, and latterly the electric arc makes playwork out of the task of opening up frozen tuyeres and chilled iron and cinder notches, compared with the sledge and chisel of the olden days.

Scaffolding.—When the accumulations which give rise to bottom slipping cease to come off, *i. e.*, become chronic, we have scaffolding. There can be no doubt that scaffolding starts in the zone of fusion, and is due to the causes that give rise to the bottom slips. If that is true, what would prevent the latter would make the former impossible. Whether these disturbances can ever be entirely overcome may be questioned, yet there is still so much room for improvement in furnace practice, *e. g.*, in the preparation of the ore and flux, the selection of the fuel, the manner of charging, uniform blowing, desiccation and regular heating of the blast, etc., that many of the troubles now of still too frequent occurence may be almost if not entirely eliminated.

Mechanical Conditions.—The proper distribution of the stock is one of the most important factors in the operation of the modern blast furnace, and this has been greatly emphasized since the introduction of the automatic charging apparatus. There are few conditions in connection with the designing and management of the modern blast furnace that have given so much trouble and worry to the engineer as well as the furnace manager. While much has been done to overcome the inherent tendency of the skip-hoist to distribute the coarse and fine ore unequally, and much improvement has been made, the charging device that will distribute all the different kinds of material satisfactorily has not yet been invented, or, if invented, has yet to demonstrate its practicability and effectiveness.

The ideal charging apparatus, in addition to fufilling the paramount requirements of being strong, durable, and forming perfect gas seal, should be under such control of the man in charge that the material charged, irrespective of its physical condition, can be distributed from the hopper evenly over the entire area of the furnace or practically in a ring against the outer wall, all in the center, or in intermediate circles, or, if need be, in a heap in any desired point of the compass. With such a charging apparatus many of the difficulties now encountered would be entirely avoided, and such irregularities in the settling of the stock which might still occur could be speedily remedied. To be able to use such a charging apparatus to its full possibility it should be supplemented by an automatic stock level indicator.

Whether the above ideal will ever be reached, or even approximately realized in practice, may be questioned; but there can be no question as to the shortcomings of all existing apparatus. The bell and hopper which fulfils the first three requirements perfectly, falls far short as a distributor because of its narrow limitations and inflexibility, especially in connection with the automatic skip hoist.

When filling is done by hand it is generally possible, by exercising proper care and judgment, to distribute the stock in a manner most conducive to good results. All the ores should be separated into at least two classes physically, viz., coarse and fine. At hand filled furnaces this can generally be accomplished without special apparatus, and the stock can be charged into the furnace in accordance with any method the manager may desire, within the limits of the apparatus, which allow great variation, and in this way much can be done to secure uniform working, provided there is sufficient intelligence and vigilance available on the stock house floor.

Barrows' Method of Charging.—This method was described by Mr. Barrows, Jr., before the Atlantic meeting of the American Institute of Mining Engineers, and may appropriately be called heterogeneous charging.

Assume, for example, that the ore mixture consisted of 25 per cent. of magnetic concentrates, 25 per cent. of fine hematite, 25 per cent. of coarse hematite and 25 per cent. of coarse magnetite, and that a round of ore consisted of 12 barrows.

On this assumption (using the points of the compass for convenience of explanation) the charging would proceed as follows: The coke charge having been lowered into the furnace, then, starting in the north, fill 3 barrows of concentrates side by side, in the northeast quarter; next 3 barrows of coarse hematite, in the southeast quarter; then 3 barrows of fine hematite, in the southwest quarter; completing the round with 3 barrows of coarse magnetic ore in the northwest quarter of the hopper. The next round would start in the east with 3 barrows of concentrates above the coarse hematite, next 3 barrows of coarse magnetic ore over the fine hematite, then 3 barrows of fine hematite over the coarse magnetic ore, closing with 3 barrows of coarse hematite over the concentrates. Thus getting every ore into every part of the furnace in regular routine, the coarse and fine ores alternating both as to their vertical and horizontal relation; the main object of this method of filling being to break up the continuity of the gas currents and thus prevent channeling, reduce flue dust and obviate irregularities in general. Mr. Barrows has practiced this method with very good success. It is applicable to all hand filled furnaces, and could be adopted with advantage by all furnaces having to smelt ores differing very much in degrees of fineness.

Uehling's Method of Charging.—Prior to the advent of the closed furnace tops it was the universal practice to mix the fuel and its burden as much as possible. Every barrow of fuel was invariably followed by a barrow carrying its quota of ore and flux. This method was continued as much as possible after the general adoption of the bell and hopper. At the works in Sharpsville, Pa., where the author first made his acquaintance with the blast furnace, in 1879, the fuel charge consisted of 2 barrows of block coal of 500 pounds each, and 2 barrows of coke weighing 300 pounds each, a total fuel charge of about 1,600 pounds. The 2 barrows of coal were dumped into the hopper opposite, and the 2 barrows of coke into the gaps left between them. Four barrows, of which each carried its proportion of ore and limestone, were dumped over the fuel and all were lowered into the furnace together, thus mixing fuel and ore as much as possible. After studying "Bell's Phenomena of the Blast Furnace," and particularly "Grunner's Analytical Studies of the Process of Smelting," the author came to the conclusion, based entirely on theoretical reasoning, that it was all wrong to mix the ore and fuel in charging a blast furnace; that, on the contrary, they should be separated as much as possible in order to obtain the best results. The theoretical reasons, both chemical and physical, why this should be so, were fully set forth in a paper, published in the "Stevens' Institute

Indicator," in 1884, and again alluded to in my contribution to the discussion of Mr. Barrows' paper read before the Spring meeting of Mining Engineers at Atlantic City, so that it will not be necessary to repeat them here. Briefly, the method of stratified charging consists in filling the fuel and ore in separate layers. The fuel charge should be as heavy as is consistent with the size of the furnace, forming a uniform strata not less than 2 feet deep. In a furnace over 80 feet high preferably deeper, the ores should be filled on the fuel in strata, beginning with the coarsest and ending with the finest. The limestone, being coarse, should go on top of the strata of coarse ore. It should be kept, as much as possible, from coming in direct contact with the fuel. Different ores of the same degree of fineness should be charged with regard to their capacity for carbon deposition. This very important phase in the phenomena of smelting was very ably discussed by Mr. F. E. Bachman in a paper read before the Colorado meeting of the American Institute of Mining Engineers, but has not received the attention it deserves. In how far the method of charging above briefly outlined can be carried out in practice, depends on local conditions, which would have to be studied on the premises in each case. It may be safely said, however, that there are few furnaces, the running of which could not be very appreciably improved by the application of stratified filling. It can be carried out equally well by hand or any of the approved automatic filling devices.

Gas.—The blast furnace gas is a most important factor in the process of smelting not only inside, but also outside of the furnace. Inside of the furnace it distributes the heat and reduces the ore to the metallic form. How well it performs these functions can always be ascertained from its temperature and chemical analysis. The first symptoms of irregularities in the process of smelting manifest themselves in the gas. A continuous record of the CO_2 would be of the greatest value to the observant blast-furnace manager. The continuous autographic record of the gas temperature has been found by those who give it attention to be an invaluable aid in diagnosing irregularities in the working of the furnace.

Every furnace man knows that a hot top is indicative of a cold bottom. This will be readily understood from the fact that 100° of heat in the escaping gas is equivalent to over 4.25 per cent. of the heat generated by the fuel burned at the tuyeres. Thus, an indirect fuel loss of from 10 to 15 per cent. may easily take place unnoticed until 4 or 6 hours later sharp cinder and inferior iron reveals the fact that something went wrong.

In addition to revealing internal conditions of the furnace, the autographic gas temperature record indicates the charges that go into the furnace, both as to time and number, and is, therefore, a most valuable check on the stock house operation.

In a paper, entitled "The Blast Furnace as a Power Plant," the author endeavored to show by simple process of calculation that, under conditions of best average fuel consumption, viz., 2,000 pounds of coke per ton of iron, and proper treatment and utilization of the gas, there would be a surplus of at least 800-horse power per ton of iron produced per hour. Or, in other words, a blast furnace of a daily capacity of 250 tons, or, in round numbers, 10 tons per hour, should have a surplus of gas over and above all furnace requirements, sufficient to generate 8,000-horse power in any of the available types of large gas engines. Other investigators, notably Mr. B. H. Thwaite, who is the pioneer in the field of direct utilization of blast-furnace gas in the gas engine, have come to similar conclusions.

Since publishing the above calculations, the author has had opportunity to investigute the blast furnace gases at a number of the large iron and steel plants, and has found that his figures were very conservative; thus from 1,000 to 1,200-horse power is nearer the actual surplus power that should be available.

In view of these facts, and the practically more weighty fact that on the Continent of Europe, especially in Germany, there is scarcely a furnace plant where not from several to many thousand horse power are generated by blast furnace gas direct, is it not strange that, with one laudable exception, nothing at all has been done to save the enormous waste now going on because of the irrational application of the blast furnace gas?

From 45 per cent. to 50 per cent. of the heat value of the fuel used in the process of smelting in the blast furnace is contained in the escaping gases, of which 35 per cent. should be sufficient to heat the blast and produce the power to run the furnace and all its mechanical accessories. In spite of this enormous theoretically demonstrable surplus heat energy, the fact remains that, at the majority of the blast furnace plants, hundreds of tons of coal are burned annually to asist the gas in generating the necessary steam for the power required, and it is the exception rather than the rule that the desired blast temperature can be regularly obtained from the stoves, notwithstanding the fact that both stoves and boilers have from time to time been increased both in size and number. The sole reason of this deplorable condition is due to the fact that the uncleaned gas cannot be efficiently utilized. It is just as irrational to burn the impure gas as it would be to attempt to burn coal mixed with all the slate and rock that are dug and raised with it from the mine.

The partial purification employed at the majority of plants in the dry way is based on irrational methods and carried out by primitive and inadequate means, and rarely more than the coarsest of the flue dust is separated from the gas. The attempts at washing are generally carried out by half way methods, which, although they remove much of the finer dust, are liable to contaminate the gas to such a degree with moisture that the harm overbalances the good accomplished.

The subject of gas purification is too vast to do more than allude to it at this time. I consider it the most important problem before the blast furnace manager and engineer to-day. Even if we leave out of sight the value of the surplus gas for power purposes, the saving in extra boiler and stove equipment, in wear and tear on the latter, in time lost directly and indirectly because of stoppages for cleaning, inadequate steam and heat, coal burned, and cost of labor for cleaning stoves and boilers, etc., would more than justify the cost of a gas washing equipment that would properly cleanse the gas.

Indoor Humidity.

By Henry Mitchell Smith, M.D., Brooklyn, N. Y.

The demands of our variable winter climate, especially along the Atlantic Coast, have led to the development of devices for heating buildings by steam, hot water and hot air that are beyond criticism if considered from a standpoint of mechanical perfection and efficiency as heat producers. The principle upon which modern heating systems are based is erroneous, however, in that the idea is simply to heat the air to a desired temperature, as indicated by the thermometer. Here is the great error. The air temperature alone is an insufficient index of our sensations of heat and cold. All methods of heating that neglect to provide that important atmospheric element, watery vapor, are almost certain to bring about overheating or uncomfortable chilling. The key to this uncomfortable and unhygienic feature is the low relative humidity of the indoor atmosphere which is bound to exist unless provision is made for controlling it. It is a fundamental principle in climatology that the relative humidity of any location is of the greatest importance, and yet in regulating the "climate" of our homes in winter this factor is entirely overlooked. References to the dryness of heated rooms have as a rule been so indefinite that they have failed to carry due weight, and the importance of the subject has not been fully appreciated. Some of us have endeavored to fulfil the requirement by placing pans of water in the air ducts of furnaces, but still the problem of sufficient moisture has remained unsolved.

At the outset of this investigation it was necessary to know exactly the meaning of the phrase "overheated houses." In order to obtain data from which a starting point for improvement could be made, records of the temperature in a large number of houses have been taken by the writer. It was found that it commonly ranged from 72 to 76°, and at times, in very cold weather, 78° F. was recorded.

Dryness Necessitates High Temperatures.—Startling as these figures are in themselves and contrary to all accepted ideas of the proper conditions for living rooms, yet a puzzling fact was that the sensations of the occupants were frequently not in accord with the readings of the thermometer. Rooms felt chilly when the recorded temperature indicated that they were far too hot. It was often hard to believe that the temperature was above 68°, when it was actually 72 to 74°.

It was at once apparent that some unrecognized factor was responsible for this discrepancy between the temperature recorded by the thermometer and one's sensations. Moreover, it was found that the colder the weather the higher was the average temperature maintained indoors, an observation which anyone may verify and which will show that rooms may feel warm at 70° to-day and decidedly chilly at 72° or 74° to-morrow. The reason for this is the insufficient amount of moisture in our rooms in proportion to the temperature (low relative humidity). The colder the weather the lower will be the indoor relative humidity.

During the winter of 1901 repeated records of the relative humidity taken in many different buildings accumulated a mass of figures which

established the fact that 30 per cent. is the average in rooms heated as described.

Humidity too Low.—This statement is in accord with the findings of other investigators. "The Proceedings of the Convention of Weather Bureau Officials," held at Omaha in 1898, contains a paper entitled "Atmospheric Moisture and Artificial Heating," by W. M. Wilson, of Milwaukee, who found that in buildings heated by steam and hot water, with an average temperature of 72°, the relative humidity was 28 per cent., while with furnace heating it was as low as 24 per cent. Wilson refers to experiments made by Barnes, of Boston, who found the relative humidity at a temperature of 72° to be 31 per cent. He also refers to investigations of Mr. Henry in the Weather Bureau Building at Washington during March, 1896, where it was found that at 72° the relative humidity was 31 per cent. Now, the United States Weather Bureau reports show that such a low average relative humidity naturally occurs only in the most arid regions. The reports contain tables of the mean monthly and yearly relative humidity observed at official stations throughout the United States, and cover periods of from 5 to 14 consecutive years. These tables show that from the total 130 stations in only 10 is the mean annual relative humidity as low as 50 per cent.

Denver, Col., is a place one usually associates with the term "dry climate." There the mean annual relative humidity is 48.7 per cent.—nearly 20 per cent. higher than that of the winter atmosphere of our homes. The Weather Bureau maps, showing the normal annual relative humidity in the different sections of the United States, disclose the startling fact that the area where the average is 45 per cent. comprises the section of country generally designated "the arid region of the Southwest," or "the Great Southwestern Desert."

Dryness in Coast Cities.—We are principally interested however, in the average outdoor relative humidity of New York city, where indoor records were taken, and I shall give only that of the months of October to April, inclusive: October 73.9 per cent. November 74.8 per cent.; December, 73.6 per cent.; January, 75.2 per cent.; February, 73.6 per cent.; March, 71.1 per cent.; April, 67.8 per cent. Comparison of these figures with 30 per cent. observed indoors shows at once the great contrast between the natural and the artificial conditions, and further elaboration of this point will reveal the fact that we are spending a great part of our lives in an environment the effect of which cannot but be detrimental. The comparison will also explain many of the discomforts experienced in artificially heated rooms. Within extreme limits the effect upon the human organism is dependent upon the percentage of saturation of the aqueous vapor and not upon the amount of vapor present. Hann says, in his "Handbook of Climatology": "All organic substances are more or less hygroscopic, and this condition, so far as it depends upon the humidity of the air, is determined by the relative and not by the absolute humidity."

Dryness Detrimental to Health.—The point to be emphasized is that every time we step out of our houses during the winter season we pass from an atmosphere with a relative humidity of about 30 per cent. into one with a relative humidity of, on an average, 70 per cent. Such a sharp and violent contrast must be productive of harm, particularly to the delicate mucous membranes of the upper air passages. Watery vapor, what we term moisture, is as much a part of the air as is oxygen; absolutely dry air does not exist in nature. It is with certain conditions of this vapor that we have to deal. The higher the temperature the more of a given vapor is required per unit of space before the vapor becomes saturated. A cubic foot of saturated watery vapor at a temperature of 30° F. weighs 1.935 grains; at 70° F. it weighs 7.980 grains whether the cubic foot contains air or not.

Moisture Carried in Air.—A vapor is said to be saturated when in a unit of space at a given temperature the maximum amount by weight exists and, the temperature remaining the same, no more vapor can form from the liquid with which the vapor is in contact. There will be no evaporation. If the temperature is reduced some of the vapor will be changed back to a liquid. Now, if the temperature be raised the previously saturated vapor becomes an unsaturated vapor, because with increase of temperature more vapor is required for saturation. Thus, at a given temperature, if the weight required for saturation is double that of the existing weight the vapor is said to be "50 per cent. saturated."

It is the tendency of all volatile liquids to form saturated vapors; this is spontaneous evaporation, and it follows that our sensations of "moist" and "dry" are wholly relative, depending upon the rapidity with which the tissues of the body, particularly the skin and mucous membranes, are called upon to give up water.

A given amount of watery vapor in the atmosphere to-day at a certain temperature may be nearly saturated and demand little moisture, and the air feels damp because our bodies give up little water to the atmosphere. The same amount of vapor at a higher temperature will be further from saturation and the air will then feel much drier, because, although the same amount of vapor is present in each case, in the latter instance the lower percentage of water demands more moisture and causes the human body to give up more than the skin and the mucous membranes.

(To be Continued.)

Trade Mark Registration.[1]

The Bonynge Trade Mark bill, which passed the Senate a fortnight ago, has finally reached the President, after an animated discussion of certain of its provisions in the conference between the two houses, and, following the usual custom, has been submitted to the Commissioner of Patents for a recommendation. It can be stated that Commissioner Allen will heartily indorse the bill, and there is no doubt that it will receive the President's signature within a few days, although if he chooses he can hold it for the constitutional period of 10 days. The chief of the Trade Mark Division of the Patent Office has practically completed a very careful revision of the regulations to be promulgated under the new law, and this will be printed for general distribution as soon as the bill is signed.

The discussion of the bill in the Conference Committee proved to be much more important than was expected. The principal amendments added by the Senate related to the proviso to Section 5 of the bill, which as finally passed by that body reads as follows:

And provided further, that nothing herein shall prevent the registration of any mark used by the applicant or his predecessor or by those from whom title to the mark is derived, in commerce with foreign nations or among the several States or with Indian tribes, which was in actual and lawful use as a mark of the applicant or his predecessors from whom he derived title, for 10 years prior to the passage of this act.

It was contended by the House conferees that in order to register an old trade mark the claimant thereof must be able not only to show actual, but exclusive use, and many illustrations were presented of old trade marks which have been employed by several manufacturers, no one of whom could maintain and claim to be the sole owner thereof. There was also some discussion concerning the propriety of the use of the word "lawful" as applied to a trade mark, the contention being made by certain of the conferees that the question as to the legality of an old trade mark ought not to be raised in this connection. The Senate conferees finally conceded these points, and the words "and lawful" were stricken out and the words "and exclusive" inserted in their stead.

The phrase "prior to the passage of this act" was also criticized by certain of the conferees as misleading. It was pointed out that many trade marks employed years ago for a period of 10 years have since been abandoned and have become public property, but under the terms of this act such marks could be resurrected and reregistered. It was suggested, therefore, that the words "prior to" be stricken out and "next preceding" inserted in lieu thereof. This suggestion was agreed to by the Senate conferees and the bill was finally passed with the proviso to Section 5 amended as indicated.

As briefly stated last week, the deputy commissioner of patents and the chief of the trade mark division of the Patent Office express the opinion, unofficially but quite unreservedly, that it is advisable for all trade mark owners whose marks are employed in interstate commerce to re-register them under the new statute, that will go in force April 1. This opinion is based largely upon the decision of the United States Supreme Court in the case of Warner vs. the Searle & Hereth Company, in which it was held that the law of 1881, which the new Bonynge act will displace upon the statute books, provided only for the registration of trade marks employed in commerce with foreign countries or with Indian tribes. The court in that case disclosed the fatal defects in the existing law which it is hoped have been cured by the measure which Congress has just passed, holding that trade marks employed in interstate commerce were not eligible to registration in the Patent Office, thereby withdrawing Federal protection from a number of well-known marks in use for many years.

In the opinion of the official experts, this decision of the court practically nullified the registration in the Patent Office of many thousand trade marks recorded in the past 24 years, except so far as their use in

1. By "W. L. C.," in *Iron Age*.

commerce with foreign countries or with the Indian tribes is coneerned. These marks, therefore, hav e no standing to-day in commerce between the States by virtue of registra tion in the Patent Office; but the Bonynge bill, which provides that "the owner of a trade mark used in commerce with foreign nations, or among the several States, or with Indian tribes, provided such owner shall be domiciled within the territory of the United States, or resides in or is located in any foreign country which, by treaty, convention or law, affords similar privileges to the citizens of the United States, may obtain registration for such trade mark by complying with the following requirements, etc., cures this defect in the law by specifically authorizing the registration of marks employed in interstate commerce.

The only possible question that can be raised in this connection is as to whether the enactment of the Bonynge bill may not operate to legalize trade marks heretofore registered; in other words, as to whether it may be given a retroactive effect extending to interstate commerce the scope of the protection originally granted only for commerce with foreign countries and the Indian tribes. The Patent Office authorities have given very careful consideration to this question, but do not hesitate to advise the reregistration of all old marks. The reluctance of courts to treat the operation of a statute as *ex post facto* is fully appreciated, and while it is deemed possible that a retroactive effect may be given to the new law the chances of such a construction are so slight that manufacturers are advised not to take the risk with so valuable a piece of property as a successful trade mark. It should be understood, of course, that this advice does not apply to a comparatively small but important class of trade marks employed exclusively in foreign commerce which do not require to be reregistered, as the law heretofore in force amply protects them.

Prompt steps should be taken by all manufacturers to bring their trade marks before the Patent Office for reregistration, in view of the fact many thousand will be presented within the next few months, taxing severely the comparatively small force of the Trade Mark Division. It is estimated that the business of this division will be more than doubled during the first year under the new law, and to meet this condition the Secretary of the Interior has asked Congress for an appropriation of $20,000 to be made immediately available. This appropriation will provide for 14 additional clerks, including one principal examiner of trade marks and designs at $2,500, two first assistant examiners at $1,800, etc.

Estimates for a Municipal Electric Lighting Plant.

These figures, which are merely put in print for laughter by those who know as they read, were the estimates for a municipal electric lighting plant for New York city, submitted to Mayor McClellan by an "expert commission," the members thereof being Messrs. Cary T. Hutchinson, George F. Sever and Nelson P. Lewis. This commission estimates that the total cost of a system capable of covering the Boroughs of Manhattan and the Bronx with 6,000 arc lamps and 250,000 16-candle power incandescent lamps will be about $4,100,000, exclusive of the cost of the real estate.

The report places the total cost of a power station, with a capacity of 10,000 kilowatts, including coal storage, coal handling apparatus, building, complete boiler plant equipment, engines, generators, switchboards and interest during construction, but excluding real estate, $1,250,000 The total cost of high pressure cables, sub-station buildings, transformers, switchboards, arc lighting circuits, centers of distribution for incandescent lighting, lamp posts, lamps, meters and all appliances necessary to make a complete operative plant, up to and including the lamps, including the cost of real estate, but excluding the cost of the main duct system, all for the capacity of 6,000 watt arc lamps in Manhattan and the Bronx and for 250-candle power incandescent lamp equivalents, will be $2,850,000.

The committee estimated that the total annual cost of operating a 7.5 ampere, inclosed, alternating current arc lamp for 4,000 hours a year, includlng all costs, would be $75.40 a lamp. The total cost for the supply to the incandescent lamps would be $5.15. The total cost of operating this plant for 6,000 arc lamps and 250,000 16-candle power equivalents, including all operating expenses, depreciation of 7.5 per cent. and interest at 3.5 per cent., would be $906,000.

The committee has not inclnded in its estimates the cost of construction of ducts for cables nor any rental charges for duct space.

The general plan of the committee contemplates the construction of one power station for the supply of Manhattan and the Bronx, a second for Brooklyn and Queens, and a third for Richmond. The stations for Manhattan and the Bronx and for Brooklyn and Queens would be interconnected, so that each could supply either borough.

The station for Manhattan and the Bronx should be placed on the East river in Manhattan, but as this cannot be determined at once, the committee assumes that this plant will be erected on the east side of Blackwell's Island.

For Brooklyn and Queens an excellent water front site is available sufficiently near to the site of the proposed Manhattan plant to permit easy cross connection by way of Blackwell's Island Bridge.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

A Tribute to the Late James Somerville.

BLOOMINGTON, ILLS., Feb. 15, 1905.

To the Editors AMERICAN GAS LIGHT JOURNAL: As I sit by the bedside of our very ill mother, the sad intelligence comes to me of the passing away of Mr. James Somerville. Permit me to say a word, if such is possible through my expression, in praise of him, for I owe all to him and his influence.

As I look, and with the keener sensibility that comes only from the close communion between two souls, I see towering above the heads of men that pure and noble character, that beaming, loving countenance, that ever ready disposition to help and that never ending desire to do the golden rule in its simplicity.

Many are the times that I have had the communion and fellowship in love, by contact and by word, that are fountains of never ending inspiration, and as I have entered into with much soul profit by his clearly expressed views concerning the future state of man, I am glad I can say I know that his God is the One for us and his light I am sure will never go out in the hearts of the hundreds he has blest; that as time goes on his memory will become sweeter and nobler. Our loss is Heaven's admittant. JOSEPH M. BERKLEY, Protege.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Feb. 10th, 1905.

A Find of Thorium.—The Incandescent Mantle in the Railway Car.—Lady Lecturers and Gas Cookers.

A recently issued Government report dealing with the mineral survey of Ceylon contains some interesting matter for makers and users of incandescent mantles. Hitherto it has been supposed that monazite sand practically represented the world's supply of thorium, and that the financier who could control the supply of that mineral would secure the means of working a corner in the rare metal. But the report in question relates to the discovery of minerals that consist chiefly of thoria, and the importance of the same in a commercial sense is evident, when it is stated that while monazite sand yields 5 to 10 per cent. of combined thorium, the new substances contain over 70 per cent. of thoria, together with 6 or 7 per cent. of ceria. They had previously been supposed to be pitch blende or uranmite, but after complete analysis at the Imperial Institute, they have been recognized as new minerals and re-christened "Thorianite" and "Thorite." The latter consists chiefly of thoria silicate, and yields over 65 per cent. of thoria. It appears that over 95 per cent. of the mineral consists of rare metals. Thoria is the chief constituent and next in order come urania, ceria, lanthania, didymia and zirconia. Commercial exploitation only awaits reliable imformation as to the extent of the deposits, and several English firms are ready to take up the development as soon as circumstances permit. So we may anticipate that Ceylon will shortly be celebrated for something else besides spices and heathen, as the value of the minerals has been estimated at £30 per cwt., and it would appear that the cost of preparing and purifying them for use as mantle fluids would be very moderate.

An interesting experiment is in progress on the London, Brighton and South Coast Railway in connection with the lighting of trains by means of incandescent gas. It is always satisfactory to find gas being tried for purposes to which the electric light has been applied, and gas companies are in a general way beginning to notice that people who have tried electricity are amongst their best customers. The company above named, like most other railway companies have given electricity a very good innings, but that it is not entirely satisfactory is evidenced

by the fact that they are trying something else. The apparatus used is that supplied by the New Inverted Incandescent Gas Lamp Company, and the installation has been carried out by the well known firm of Pintsch's Patent Lighting Company, who have had, it is safe to state, a larger experience in railway carriage lighting than any others. The ordinary railway carriage gas lamp as used with compressed gas requires very slight modification to take the incandescent burner, and the pressure regulator is adjusted to give a pressure of 80-tenths, instead of the 10 to 20-tenths required by the flat flame burner. In order to suit the limited vertical space available, the mixing tube is horizontal and only the burner head vertical. The mantles are extra strong and in size the same as that used with the New Inverted Companies Bijou burner. No anti-vibrators are used, but the mantle is inclosed in a cage made of four fine platinum wires, so that if it should be shaken from its ring it will still be retained in position. Extended experiments, however, show that this precaution is scarcely necessary and that notwithstanding the rough usage due to sudden stopping or starting, shunting, etc., the mantles have an average life of over 2 months. The duty obtained is about 25-candles and the consumption of gas 6-tenths of a foot per hour, so that taking the gas at 5s. per 1,000 cubic feet the cost per 1,000 hours is only 3s. In respect to steadiness and efficiency the light is all that can be desired.

While on the subject of incandescent gas lighting, I may add a few words in respect to the leaflet inclosed. I find that the average gas consumer will not peruse pamphlets running to 16 or 32 pages of close type. He wants something rather more exciting than a disquisition on the efficiency or the economies of gas, to occupy his somewhat limited leisure. He may possibly get as far as the third page, so that there is some chance of any important statement introduced at the beginning coming under his notice, though in most cases the journey of the pamphlet from the front door to the stove or the waste paper basket is straight and direct. But if it is thought that the master of the house might happen to read it, only add a few tables of figures, and the contingency is effectually prevented. I find that such pamphlets may be distributed by the thousand, and yet in a week's time it is difficult to hear, not anyone who had read them, but who ever remembers the title or anything about them. But the average consumer will read a few plain facts got together neatly on one page, and will remember them, and talk about them. And that, I think, is the object of advertising.

Some of the principal lady lecturers have been stating their views in the *Journal of Gas Lighting* in response to an editorial invitation to discuss the subject of the services that qualified ladies are capable of rendering to the vendors of gas, whether such services are now applied to the best advantage, and if not, as to the direction in which to look for improvement. The writer, in introducing the subject, inclines to a negative answer as regards the first question, and admits that such a reply carries with it the duty of replying to the second, and it is to this end that he solicits the help of the lady lecturers, and has met so far with a satisfactory response. Most of the ladies, however, labor under the disadvantage that their acquaintance with the parties who are directly responsible for the control and use of the gas cooker is derided from the platform and, therefore, confined to the comparatively small proportion of the whole who have both the inclination and the leisure to attend a course of lectures. Almost every gas company has, in some form or other, introduced the lady lecturer to its customers, and it may be added with more or less successful results. But at the same time it is notorious that only a very small percentage of the whole are reached in this way. The company may issue, say, 10,000 prospectuses and admission tickets, but may safely provide accommodation for not more than 500, and then there will probably be some empty seats. So it is possible to be continually engaged in cookery demonstrations for many years without meeting with a fair average sample of the gas stove user. The subject may be divided into two heads, the first of which deals with the cookery demonstration and the possibilities of rendering it more attractive; such, for instance, as by the aid of quick cookery competitions which proved such a success at Earls' Court, and the second with methods additional and supplementary, but quite distinct from the lecture, such as house-to-house canvassing, visiting or inspection, and the giving of lessons at girls' schools, at women's classes of any kind in connection with religious or educational institutions, in private houses or in rooms specially retained for the purpose. That there is room for something to be done, I think, will be generally admitted by all who have any extended experience in the maintenance of gas cookers, in examining them when returned to store after a year or two's usage, or when considered to be worn out, and in attending to the complaint book. A considerable proportion—probably a larger fraction than that represented by the attendance at the cookery lecture—use the cooker in a slovenly or perfunctory manner. They will not even take the trouble to keep it decently cleaned, and slight defects that could be remedied in a few minutes are allowed to continue for months or even years. It is no uncommon thing to find that one of the boiling burners, or even the oven burner, is out of order and cannot be used, and that the customer intended to call about it at the gas office, but has failed to do so. Even the reliability and simplicity of the apparatus tell against it at times, as it is left to the care of a very young and inexperienced helper, whereas a more elaborate apparatus could not be neglectrd to a similar extent without serious risk and annoyance. The chief requirement appears to be to arouse interest in cookery generally and in the gas stove particularly. Frequently in a small household the mistress assists in the business or the store, and does not even see the cooker once a month.

One lady suggests that where gas stoves are hired out by the suppliers the conditions of letting should include the right of thorough inspection without notice by an authorized and qualified lady inspector. Others recognize that many mistresses of households would resent anything in the way of authorized systematic inspection as savoring of the inquisition, and as a breach of that privacy which is so dear to the heart of every englishman and englishwoman, and to meet the difficulty propose that the visits should be by request only, that a suitable announcement of the whereabonts and the qualifications of the lady inspector should be made, by slips attached to the gas bills or otherwise, inviting application for her services, and that only those who signified their willingness should be inspected. Throughout the various replies there will be noticed much difference on points of detail, but a very solid agreement to the effect that the lady lecturer can and might become a much greater power in the land than she is at present. The absence of artizans' wives and domestic helps from the lectures is particularly noticed, and it is agreeed that, notwithstanding all that has been done in the way of education, there is still a very considerable amount of ignorance in respect to even the most elementary points connected with the proper and efficient using of a gas cooker.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. C. A. Madil and Mr. J. R. Cullinane have disposed of their interests in the Texarkana (Tex.) Gas and Electric Light Company to Messrs. H. N. Morris, of Shrevesport, La., and B. C. Dawes, of Chicago. The last named are now in charge.

Mr. J. J. Garrison, formerly of the Detroit Gas Stove Company, has engaged with the Michigan Stove Company.

Write to the American Standard Composition Company for a copy of its "booklet"—we think such is the current title of anything that folds like a book, the cover of which differs in color or other matter from its internals—descriptive of the Company's paints, marine and otherwise. The Company may be addressed at Washington, D. C., and New York city. The latter complete address is 41 Wall street.

Mr. James Trimble has been appointed General Manager of the Alpena (Mich.) Gas Company. He has served it some time as Superintendent.

Mr. John I. Beggs, President and General Manager of the Milwaukee Electric Railway and Light Company, has been elected President of the Laclede Gas Company, of St. Louis. His headquarters are to remain in Milwaukee.

The Laclede Firebrick Company, of St. Louts, Mo., has just installed in its plant a complete, up-to-date laboratory, which is in charge of Mr. A. J. Aubrey, a graduate of the School of Mines, Ohio State University.

The Cadillac (Mich.) Gas Company has been succeeded by a concern with the corporate title of the Cadillac Gas Light Company. The officers are: President, E. A. Stowe, of Grand Rapids; Vice-President, George D. Van Vrankin, of Cadillac; Treasurer, Ralph S. Child, Grand Rapids; Secretary, Guy W. Rouse, Grand Rapids; General Manager, R. S. Schadelee, Grand Rapids; Superintendent, F. P. Hooper.

Mr. Wm. A. Miller, Superintendent of the gas division of the properties of the Covington (Ky. Gas and Electric Company, and who has been connected with the Company since 1873, has resigned. His successor is Mr. E. H. Earnshaw.

MR. JOHN LEARY, one of the original settlers of Seattle, and a promoter of the original Seattle Gas Company, died at his home in that city the morning of February 8th. He was in his 73d year.

AT the annual meeting of the Salem (Mass.) Gas Light Company the officers chosen were: Directors, Henry A. Hale, John H. Smith, C. F. Prichard, S. W. Winslow and A. W. Rogers; Treasurer, Benjamin W. Sluman.

AT a special meeting of the shareholders in the Providence (R. I.) Gas Company it was decided to petition the Legislature for the right to increase the capital stock from $3,250,090 to $6,000,000.

IT is authoritatively stated that the interests in control of the Pawtucket (R. I.) Gas Company have secured control in the Woonsocket (R. I.) Gas Company. The new owners were likely represented in the exchange by Messrs. Bertron, Storrs & Griscom, of this city.

A CORRESPONDENT in Boston, writing under date of the 16th inst., says: "The situation remains in *statu quo* on the question of nomination, by Governor Douglas of an Assistant Inspector of Gas for the State. Since the Governor withdrew the nomination of Mr. J. F. Regan, to avoid a clash with the Council, the succeeding meeting of the Council has come and gone without a sign from the Governor. State Inspector Jenkins has sent in three names, any one of whom it is said would be perfectly satisfactory on technical account, all being graduates of the Mass. Inst. Technology and competent analyzers, but as there are more than a dozen applicants for the job, the annual worth of which is $1,200, the Governor has not yet had opportunity to make a choice."

WE are indebted to a Baltimore (Md.) correspondent who writes under date of the 16th inst., inclosing the following from the Baltimore *News*, of the 14th inst.: "The Consolidated Gas, Electric Light and Power Company was organized to-day. It is a merger of the Consolidated Gas Company and of the United Electric Light and Power Company. It was effected at a special meeting of the stockholders of the United Electric Light and Power Company held at the Company's offices, in the Continental Building, to act on the consolidation of the Wenstrom Electric Company, of Baltimore city, with the United Electric Light and Power Company. The new Company formed by the merger of the Wenstrom Company with the United Electric Light and Power Company takes over a majority of the stock of the Consolidated Gas Company which was purchased by Mr. S. D. Warfield, acting on behalf of the Consolidated Company, from Messrs. Bertron, Storrs and Griscom, of New York, who had previously acquired it from a syndicate of Baltimore bankers. The name of the Company formed in the consolidation is the Consolidated Gas, Electric Light and Power Company. At the meeting there were present in person or by proxy holders of all of the common stock of the United Electric Light and Power Company —40,000 shares—and about 10,000 shares of the preferred stock of the same Company out of 14,000 shares issued and outstanding. The capitalization of the Company is as follows:

Four and one-half per cent. bonds.....	$75,000,000
Six per cent. prior-lien cumulative stock.....	700,000
Five per cent. cumulative preferred stock.....	6,000,000
Common stock	6,000,000

"The mortgage of the Consolidated Gas, Electric Light and Power Company to the Continental Trust Company, trustee, which was placed on record to-day, provides for an authorized issue of $15,000,000 4½ per cent. 30-year gold bonds, $8,639,000 of which will be reserved in the treasury for the future requirements of the Company. In the consolidation the United Electric Light and Power Company and the Wenstrom Electric Company, of Baltimore city, go out of existence, the Consolidated Gas, Electric Light and Power Company succeeding to all the properties and assets of those companies. The mortgage securing the new issue of bonds is a first lien on 58,220 shares of stock of the Consolidated Gas Company, being more than a majority of the stock of that Company; 8,050 shares of stock of the Mount Washington Electric Light and Power Company, being substantially all of the stock of that Company, and a lien on all the properties of the old electric light companies subject only to the outstanding bonds. The $700,000 of 6 per cent. prior lien, cumulative stock is issued to retire the $700,000 5 per cent. preferred stock of the United Electric Light and Power Company. The $300,000 preferred stock now in the treasury is canceled.

"The prior lien stock is preferred both as to dividends and to capital; that is to say, it is a lien on the assets of the Company ahead of the preferred and common stocks, and stands next to its mortgage bonds. The position of the old 5 per cent. preferred stock of the United Electric Light and Power Company, convertible under the consolidation, is, therefore, much improved, as it was only preferred as to dividends, and by converting into the prior lien stock it secures an additional 1 per cent. per annum, and a preference, as stated above, in the assets ahead of both the preferred and common stock. Holders of the old 5 per cent. preferred stock can either exchange their stock for the 6 per cent. prior lien stock or take par ($50) cash and accrued dividends to the date of consolidation. As this stock is largely held in Baltimore, it will be seen that Baltimore interests have been carefully looked after. The following were elected Directors of the Consolidated Gas, Electric Light and Power Company: S. D. Warfield, Alexander Brown, Thos. J. Hayward, W. A. Marburg, Charles Adler, F. S. Landstreet, Alten S. Miller, Charles T. Crane, Anthony N. Brady, John B. Dennis, Thos. F. Ryan and Samuel R. Bertron. Of these Messrs. Warfield, Brown, Hayward, Marburg, Landstreet and Brady were Directors of the United Electric Light and Power Company. Messrs. Miller, Crane and Bertron are Directors of the Gas Company. Messrs. Thomas F. Ryan, of New York, and John B. Dennis, of Blair & Co., New York, are additions to the Board who were not members of either of the other Boards. Mr. Bertron is of the firm selling control of the Gas Company. The new Board organized by electing the following officers: Chairman, S. Davies Warfield; Vice-President, Alten S. Miller; Manager, Douglas Burnett; Secretary-Treasurer, W. S. Symington; Engineer, P. O. Keilholtz; Executive Committee, S. Davies Warfield, Alexander Brown, Anthony N. Brady, Thomas J. Hayward, John B. Dennis and Wm. A. Marburg. Mr. Warfield was elected Chairman. It is understood that the office of President will not be filled for some time. Mr. Miller, who was elected Vice-President of the Company, has been and is now General Manager of the Consolidated Gas Company. He has been active in the management of the Gas Company, and has contributed largely to the success of that Company. Mr. Douglas Burnett, who was elected Manager in Chicago of the electrical department, has been Manager of the United Electric Light and Power Company. Mr. W. Stuart Symington, elected Secretary and Treasurer, was Secretary and Treasurer of the United Electric Light and Power Company. Mr. P. O. Keilholtz, who was elected Engineer, in charge of the electrical department, occupied a similar position with the United. It is authoritatively stated that the policy of the old Gas Company will continue as at present, it being felt that the present management has been most efficient and satisfactory to the stockholders." Yes?

AT the annual meeting of the Bay City (Mich.) Gas Company the officers elected were: President, John C. Hewitt; Vice-President, B. C. Cobb; Secretary, H. C. Morris; Treasurer, C. E. Mershon.

GAS is to be supplied to Bristol, Pa., by means of a pipe under the Delaware river, hooked up to the Burlington (N. J.) division of the properties of the New Jersey Public Service Corporation.

WE understand that Mr. C. A. Tucker, formerly Treasurer of the Laclede Gas Company, of St. Louis, has been appointed Secretary of the Rochester (N. Y.) Railway and Light Comyany.

AT a meeting of the Board of Directors of the Providence (R. I.) Gas Company, Mr. Royal C. Taft having tendered his resignation as a Director, the following action was taken by the Board:

"The Honorable Royal C. Taft having tendered his resignation of the office of Director in the Providence Gas Company, it is voted that, in deference to the wishes of Governor Taft, his resignation be accepted.

"Governor Taft's service upon the Board commenced August 28th, 1872. During the period of his connection with the management of the Company he filled with marked ability the office of President for 8 years.

"To a community upon which this useful and eminent citizen has left so many marks of his conspicuous ability, his untiring energy and his exalted character, it may seem needless to speak of the value of Governor Taft's contributions to the prosperity of the Providence Gas Company. But his record as a citizen will not suffer by the mention of his long and able service to this Company—a service that can be traced in its conservative policy, in its healthful development and in its scrupulous observance of all of its obligations.

"His associates, who bear willing testimony to their obligations to Governor Taft, part with him with unfeigned regret. They hope that his days may be long in the land which he has mellowed and enriched by his long toil, and that 'his morns may be joyous and his eves have done with care.'"

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, FEBRUARY 27, 1905.

The Market for Gas Securities.

A very queer situation exists for the moment in the New York county gas supply. Mr. Odell hangs fire, likely for the reason that not only is his powder smokeless but it is not dry. Gov. Higgins and his friend are quite alive to the fact that the barge canal scheme needs water, and also money, without either of which navigation might be impeded. To go further, New York needs light of a good sort at night, so it now looks a case of "you" and "us." We need good light and are willing to pay the price; up-State needs water, let those who need, buy. So under the circumstances it looks to us there will be no cut in local gas rates this year, unless it is also agreed upon that quality—dear Mr. Grout, never mind the meters—shall also go overboard. Consolidated closed to-day (Friday) at 204½ to 205, ex-div.

Brooklyn Union is 210 bid. As we have said before, the Company is planning extensive improvements. Peoples, of Chicago, is steady, in fact, strong; Washington (D. C.) slacked off a bit on realizing; Cincinnati Gas and Electric goes on to higher values; the Baltimore deal is closed, and Lacledes are not altogether beyond reach of investors—especially the preferred—which can be bought at 95.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

FEBRUARY 27.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	204½	205x
Central Union, Bonds, 5's	3,000,000	1,000	108¼	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Mutual	5,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	112	113¼
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	.
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's	1,250,000	1,000	104	106
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106⅛	108⅛
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	210	215
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	—	—
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	500,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	5¼
" " Bonds, 5's	5,250,000	1,000	66	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	107¾	108
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,683,750	100	88¼	89¼
Preferred	3,036,500	100	107½	109
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	85	85½
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99¼	100
Detroit Gas Co., 5's	381,000	1,000	75	75¼
" Inc. 5's	16,000	100	98¼	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104½	105½
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 6's	2,650,000	..	106½	108
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102¼
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	..
Preferred	2,500,000	100	96	100
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	136	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	2,000,000	25	500	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	108¼	108¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58½	58¾
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	94	96
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	333½	335
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600,000	50	200	..

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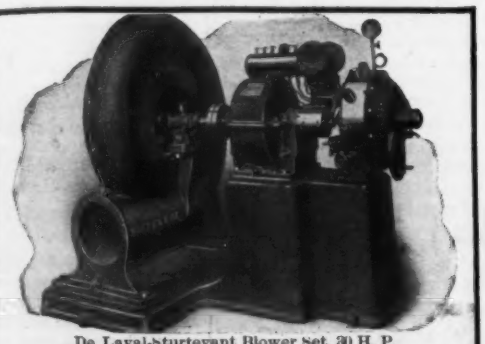

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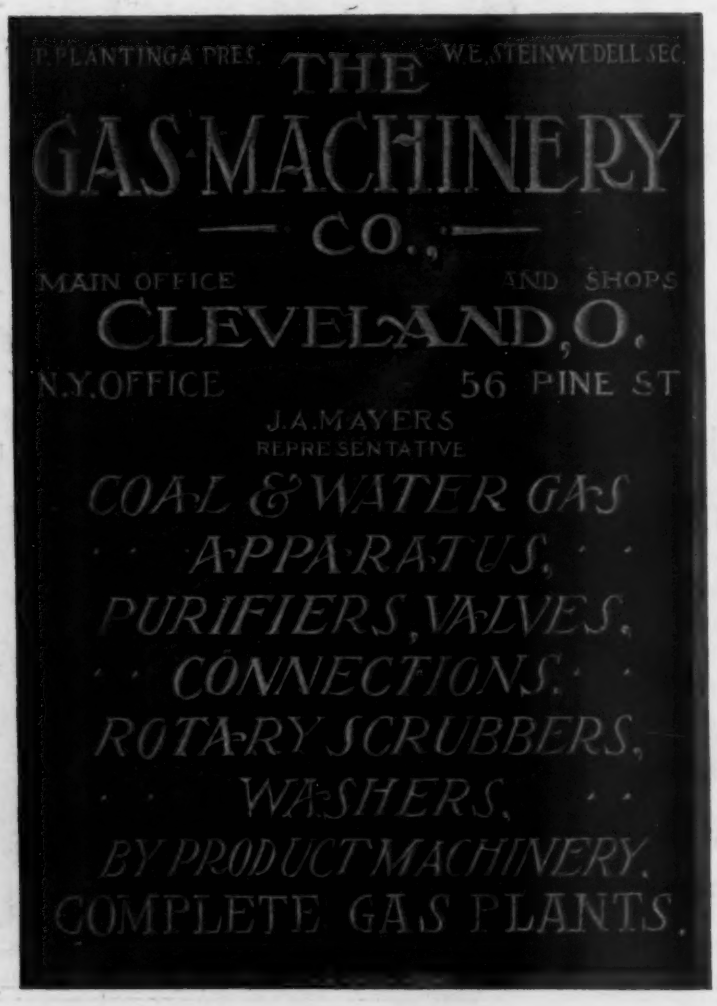

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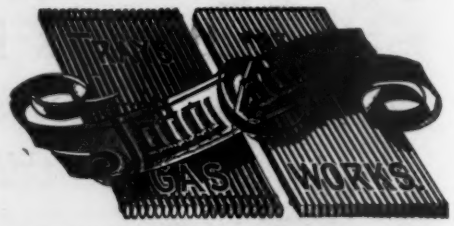

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W. M. CRANE COMPANY,

NEW YORK,

Have you a Bray Blue Book? SOLE AGENTS FOR THE UNITED STATES.

THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

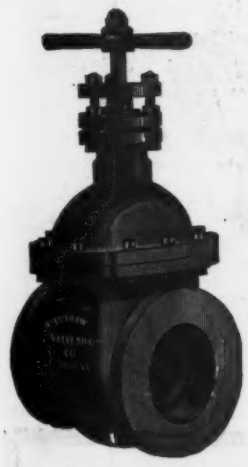
Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.



Continuous Bucket Coal Conveyor

Carried by wrought steel truss. Installed for the Boston Elevated Railway Co., Charlestown, Mass. Machinery receives from track hopper, to which coal is delivered by one-ton locomotive crane, and discharges to overhead distributing conveyor.

"Link-Belt" covers every step of this installation—not only the chain and conveyors, but the track hopper, the crane, the steel truss work—the entire design and construction of the machinery.

Write for Link-Belt literature.

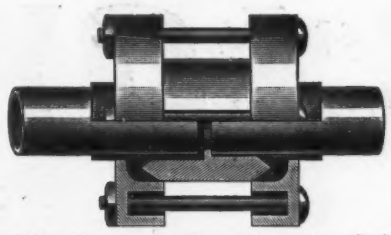
LINK-BELT ENGINEERING CO, PHILADELPHIA.

NEW YORK: 49 Dey St. *PITTSBURG:* Park Bldg. *CHICAGO:* Link-Belt Machinery Co

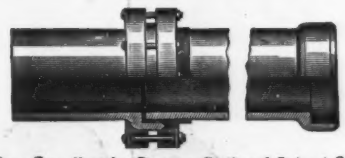
S. R. DRESSER,

BRADFORD, PENNSYLVANIA, U. S. A.,

Patentee and Manufacturer of Specialties for Oil and Gas Lines.

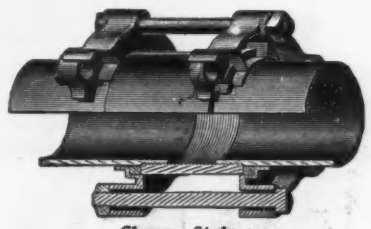


Insulating Coupling for Wrought Iron Pipe. Style 8.

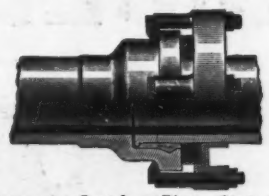


Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.

Regular Sleeve. Style 2.



Clamp. Style 4.



Clamps for Cast Iron Pipe. Style 4½.

Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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Telephone, 204-A TRENTON, N. J., Telephone, 204-A

Constructing Engineer and Contractor.

Estimates Furnished on any kind of Work in Connection with Gas or Water Plants.

SPECIAL ATTENTION GIVEN TO THE REMODELLING AND EXTENDING OF THE PROPERTIES OF WORKS NOT UP-TO-DATE.

CORRESPONDENCE SOLICITED.

LLOYD'S P. & A.

Total daily capacity sold during January, 1905,

40,300,000.

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DETROIT, MICH.

MUELLER GAS COCKS.

Since in a high pressure gas system a large volume of gas is forced through a very small opening in a gas cock plug, a scratch or ring around the plug from poor grinding may permit the flow of enough more gas to cause serious trouble.

The grinding of Mueller Gas Cocks leaves no possibility of trouble arising from gas passing around the plug. After sand grinding by automatic machines the ground surfaces are polished in oil, removing every sand scratch, so that they fit gas tight without binding.

Mueller Gas Cocks are made in straight, oval and round way pattern. Straight way cocks are made in standard, extra and special grades, the oval way cocks in the extra grade only, and the round way cocks in the standard and extra grades. The cock illustrated is a special grade cock, but is a special pattern for high pressure service

Each cock is carefully inspected and assembled, is given a working test as near like actual service use as possible, bears the Mueller trade mark, and is *unconditionally guaranteed.*

We also make tapping machines and melter connections for gas works' use. Catalogues upon application.

EASTERN WAREHOUSE—Located at 254-258 Canal Street (cor. Elm), New York City, carries a full stock of Mueller goods.

THREE GRAND PRIZES were awarded Mueller Water, Gas and Plumbing goods, respectively, at St. Louis.

H. MUELLER MFG. CO.,

DECATUR, ILL., U. S. A. NEW YORK, N. Y., U. S. A.

ROOTS' GAS EXHAUSTERS.

GOLD MEDAL AT ST. LOUIS, 1904.

Installation showing our latest improved machines, with flexible rope coupling, for large units.

SEND FOR CATALOGUE.

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NEW YORK OFFICE:
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CHICAGO OFFICE:
1547 Marquette Building.

USE YOUR OWN

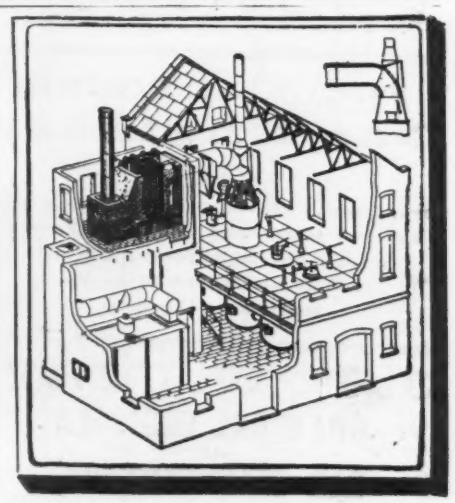
JUDGMENT.

We can send you scores of testimonials from customers, but if you are not yet using our attachments we will send you a sample, free. Try it. If not the you have ever used, we will not expect your trade. :: :: :: :: :: :: **BEST** Long warning to consumers, entirely preventing fatal accidents. Other important features.

REEVES MFG. CO., - - - - - New Haven, Conn.

Do you know That there is from **30 per cent.** to **45 per cent.** of heat, from coal used in making water gas, escaping via the stack valve unless your plant is equipped with

GREEN'S Steam Fuel **ECONOMIZER**



Do you know That in plants where it has already been installed the saving in fuel has been as high as 25 per cent.

Send for booklet if interested.

THE GREEN FUEL ECONOMIZER CO.,
Sole Manufacturers in the United States. MATTEAWAN, N. Y.

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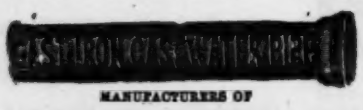
John Donaldson, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.



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CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

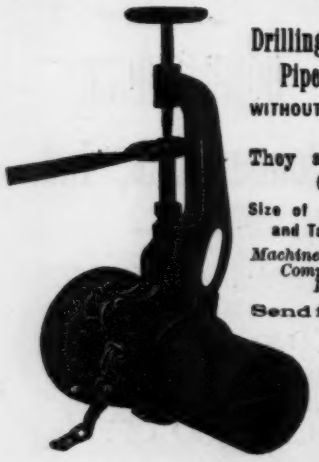
WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.



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THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,

Consulting Engineers.

Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::

PLANS,
SPECIFICATIONS
AND ESTIMATES
PREPARED.

AMERICAN OFFICE:
269 Front St., East, Toronto, Canada.

FREDERIC EGNER,
Gas Engineer,
NORFOLK, VA.,

May be consulted with reference to estimates of cost for new, or appraising actual value of existing works; utility of proposed or patented processes; relative earning power to capitalization, and management.

J. F. W. JOST,
CHEMICAL ENGINEER
—IN—
GAS MANUFACTURE,
P. O. BOX 2043. PHILADELPHIA, PA.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

From Three to Forty-Eight Inches Diameter. Also, all Sizes of

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

UNIVERSAL PIPE HAS

METALLIC JOINTS
THAT DO NOT LEAK.
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CENTRAL FOUNDRY COMPANY, - - 116 M Nassau Street, New York City.

CHARLES MILLAR & SON CO., Selling Agents, Utica, N.Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

UTICA PIPE FOUNDRY CO.

Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.

CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains Temporarily during alterations and repairs. : : : :

Any size gas main can be shut off in 30 seconds. : : :

STOPPERS SENT ON TRIAL.

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FOX HILL FOUNDRY,

F. FERGUSON & SON,

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FINE OPENING

GRATE BARS

FOR GAS WORKS.

STATIONARY, SHAKING, DUMPING.

BARS FOR HAZELTON BOILERS.

Four Roll Troughing Idler
FOR WIDE BELTS.
The positions of the rolls conform to a natural and uniform curve of the belt.

BELT CONVEYORS

EQUIPPED WITH

BALL BEARING ROLLS

Possess greater efficiency, consume less power, and the belts last much longer than when any other type of roll is employed.

Permit us to tell you why and to submit plans and estimates.

The Link-Belt Machinery Co.
Link-Belt Engineering Co. Philadelphia
Chicago, U.S.A.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

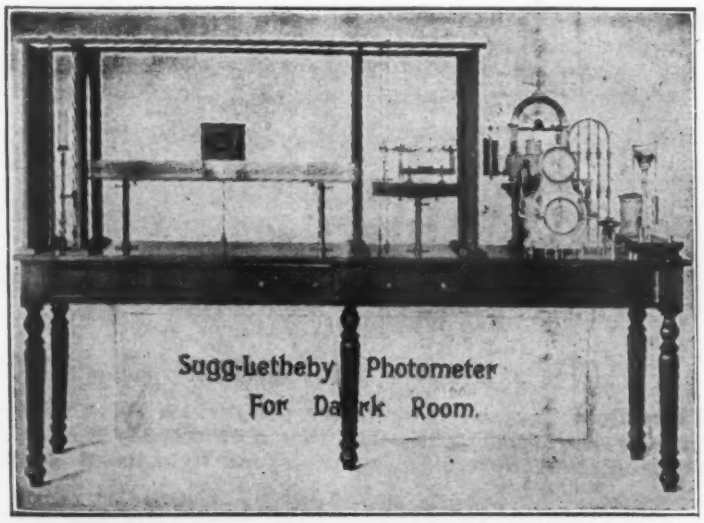
MARCH, 1905.

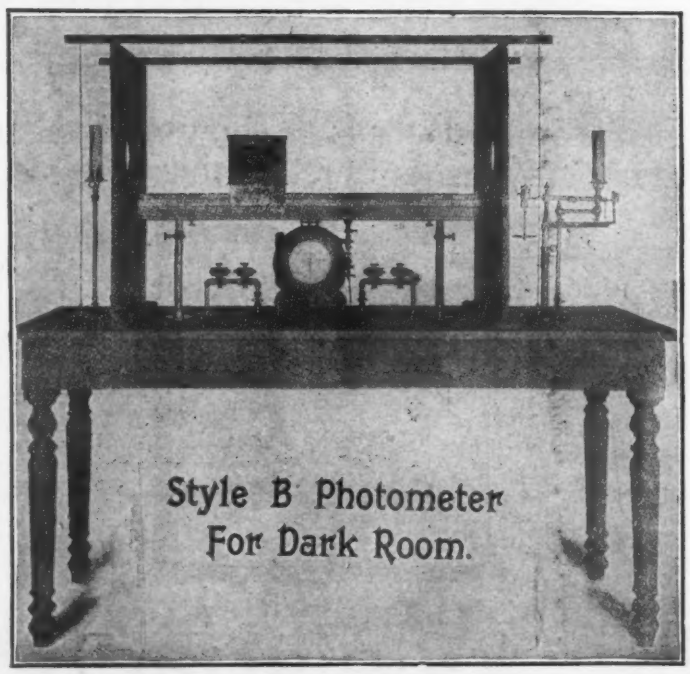
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Wed.	1	6.20 PM	5.20 AM
Thu.	2	6.20	5.30
Fri.	3	6.20	5.30
Sat.	4	6.20	5.30
Sun.	5	6.30 NM	5.20
Mon.	6	6.30	5.20
Tue.	7	6.30	5.20
Wed.	8	6.30	5.20
Thu.	9	6.30	5.20
Fri.	10	9.10	5.20
Sat.	11	10.10	5.20
Sun	12	11.10	5.10
Mon.	13	12.00 FQ	5.10
Tue.	14	1.00 AM	5.10
Wed.	15	1.50	5.10
Thu.	16	2.40	5.10
Fri.	17	3.20	5.10
Sat.	18	4.10	5.10
Sun.	19	No L.	No L.
Mon.	20	No L. FM	No L.
Tue.	21	No L.	No L.
Wed.	22	6.40 PM	9.10 PM
Thu.	23	6.40	10.30
Fri.	24	6.40	11.30
Sat.	25	6.40	12.40 AM
Sun.	26	6.50	1.40
Mon.	27	6.50 LQ	2.30
Tue.	28	6.50	3.20
Wed.	29	6.50	4.00
Thu.	30	6.50	4.40
Fri.	31	6.50	4.40

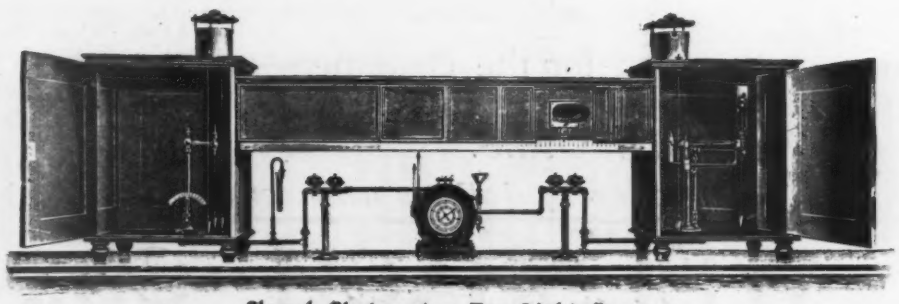
TOTAL HOURS DURING 1905.

By Table No. 1.

	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

MARCH, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light.	Extinguish.
		P.M.	A.M.
Wed.	1	5.30	5.45
Thu.	2	5.30	5.45
Fri.	3	5.30	5.45
Sat.	4	5.30	5.45
Sun.	5	5.40	5.35
Mon.	6	5.40	5.35
Tue.	7	5.40	5.35
Wed.	8	5.40	5.35
Thu.	9	5.40	5.35
Fri.	10	5.40	5.35
Sat.	11	5.40	5.35
Sun.	12	5.50	5.20
Mon.	13	5.50	5.20
Tue.	14	5.50	5.20
Wed.	15	5.50	5.20
Thu.	16	5.50	5.20
Fri.	17	5.50	5.20
Sat.	18	5.50	5.20
Sun.	19	6.00	5.10
Mon.	20	6.00	5.10
Tue.	21	6.00	5.10
Wed.	22	6.00	5.10
Thu.	23	6.00	5.10
Fri.	24	6.00	5.10
Sat.	25	6.00	5.10
Sun.	26	6.10	4.55
Mon.	27	6.10	4.55
Tue.	28	6.10	4.55
Wed.	29	6.10	4.55
Thu.	30	6.10	4.55
Fri.	31	6.10	4.55

TOTAL HOURS DURING 1905.

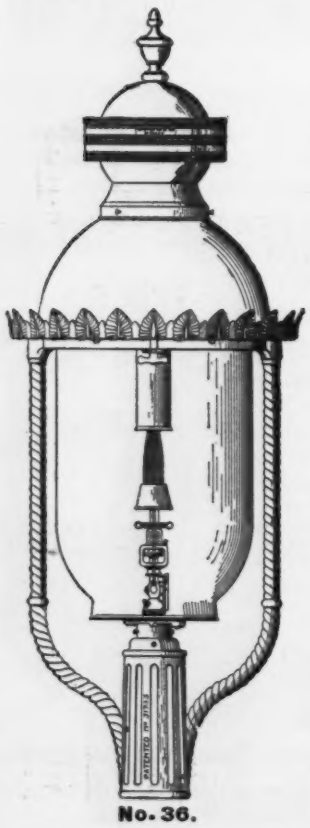
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 97 Liberty Street. BOSTON. 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting.

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple---

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31st, 1904, has been Awarded Contracts for 45 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

Harrisburg, Pa.
Pelham, N. Y.
Reading, Pa.
Augusta, Me.
Bangor, Pa.
Woonsocket, R. I. (2d contract).
Brooklyn, N. Y. (4th contract).
Cincinnati, O. (2d contract).
Scranton, Pa. (3d contract).
New York City (14th contract).
New Haven, Conn. (2d contract).
Watertown, N. Y.
Tampa, Fla. (3d contract).
Westchester, N. Y. (3d contract).
Bridgeport, Conn. (2d contract.)
St. Paul, Minn. (2d contract).
Springfield, Mass. (2d contract).
Lynn, Mass. (5th contract).
Rochester, N. Y.
Battle Creek, Mich.
Mechanicsburg, Pa.
Excelsior Springs, Mo.
Bristol, Conn.
Jersey Shore, Pa.
Vicksburg, Miss.

TOTAL SETS, 1904, ... 45
TOTAL DAILY CAPACITY, 1904, ... 56,325,000 cubic feet.
TOTAL SETS TO DATE, ... 553
TOTAL DAILY CAPACITY, ... 419,180,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

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CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

Brooklyn Fire Brick Works,

OFFICE AND WORKS:
88 VANDYKE ST., BROOKLYN, N. Y.
MANUFACTURERS OF

CLAY GAS RETORTS & SETTINGS, GENERATOR LININGS. SPECIALTIES.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

Office:
Cor. Manchester and Sulphur Avenues, St. Louis, Mo.

GEORGE R. ROWLAND,
Formerly with the Continental Iron Works.
Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

FIELD'S ANALYSIS FOR THE YEAR 1903.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 35th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by
A. M. CALLENDER & CO., 42 Pine St., New York City.

Adam Weber Sons.

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WORKS: Weber, N. J.

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Modern Coal Gas Plants,

With either Horizontal, Inclined or Vertical Retorts.

PATENTS APPLIED FOR.

No. 1. Firing horizontal benches with pulverized fuel, with either 8 or 10 retorts in 1 setting, using one furnace for two benches. Great saving in labor, fuel and life of retorts and settings. No elaboration of complex recuperation.

No. 2. Independent retort settings, taking all weight from retorts.

No. 3. Vertical retorts with vertical charge and discharge. Sixteen retorts in one bench.

MODERN BENCH IRONWORK.

ISAAC C. BAXTER, President.
Works.
LOCKPORT STATION, PA.

ESTABLISHED 1864.

JAMES GARDNER, JR., CO.,

Successor to WILLIAM GARDNER & SON.

PETER YOUNG, Secretary and Treas.
Address all communications to
JAMES GARDNER, JR., CO., Room 202 Lewis Bldg.
PITTSBURG, PA.

Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY
RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,
BENCH SETTINGS,
Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. BLOOMINGTON, INDIANA.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, BLOOMINGTON, IND.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

Bristol's Recording
PRESSURE GAUGE.

For continuous records of **Street Gas Pressure.**

Simple in construction, accurate in operation and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,
Waterbury, Conn.

Silver Medal, Paris Exposition.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE.

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,
338 Java Street, Brooklyn, N. Y.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT
LOCUST POINT, BALTIMORE, MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY, AND FIRE CEMENT.

Our Improved Half and Full Depth Benches have been Adopted by Many Gas Companies.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

1904 DIRECTORY 1904

OF AMERICAN GAS COMPANIES.

Price, - - - - - - - - - $5.00.

A. M. CALLENDER & CO., No. 42 Pine Street, New York City.

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada.

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These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins, a Specialty.

G. A. BRONDER,

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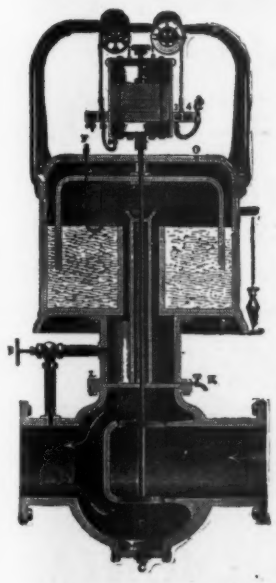

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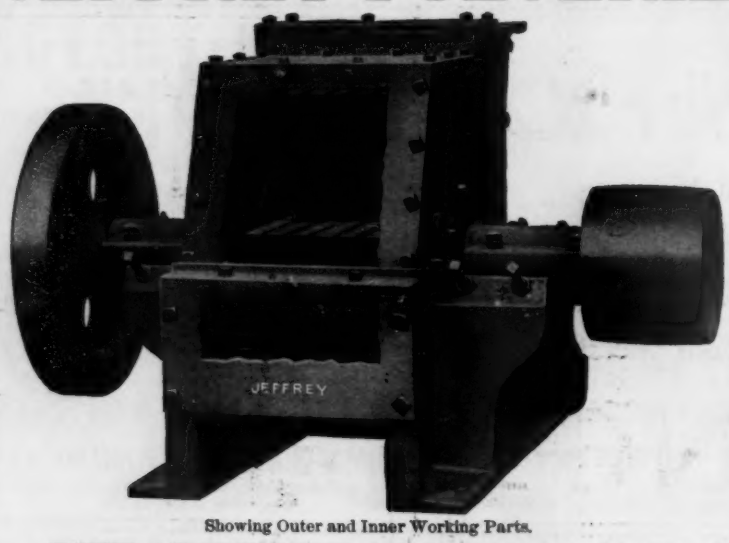

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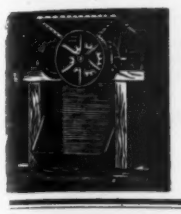

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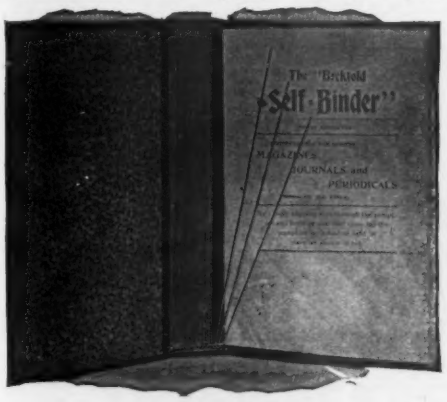

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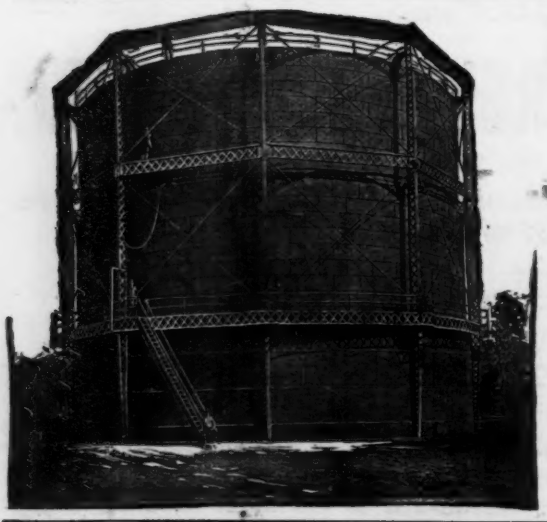

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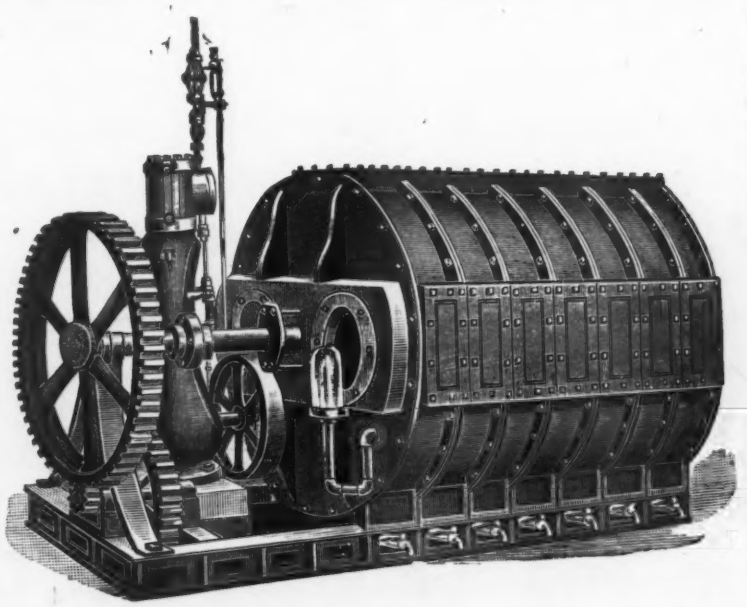

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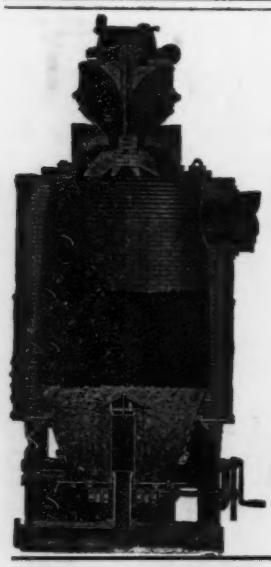

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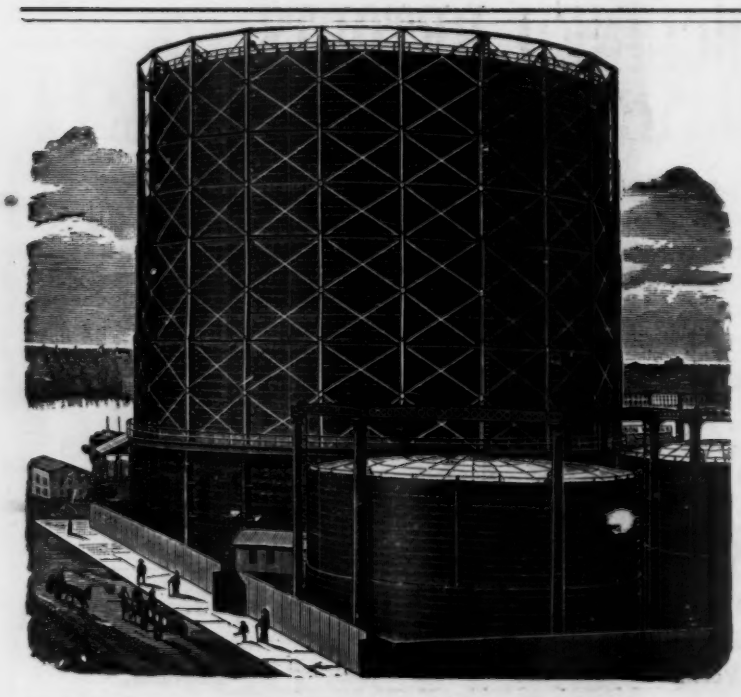

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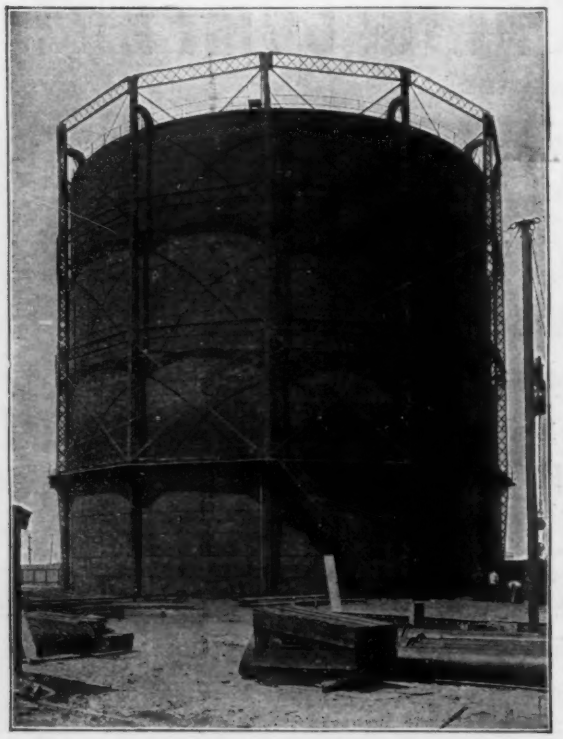

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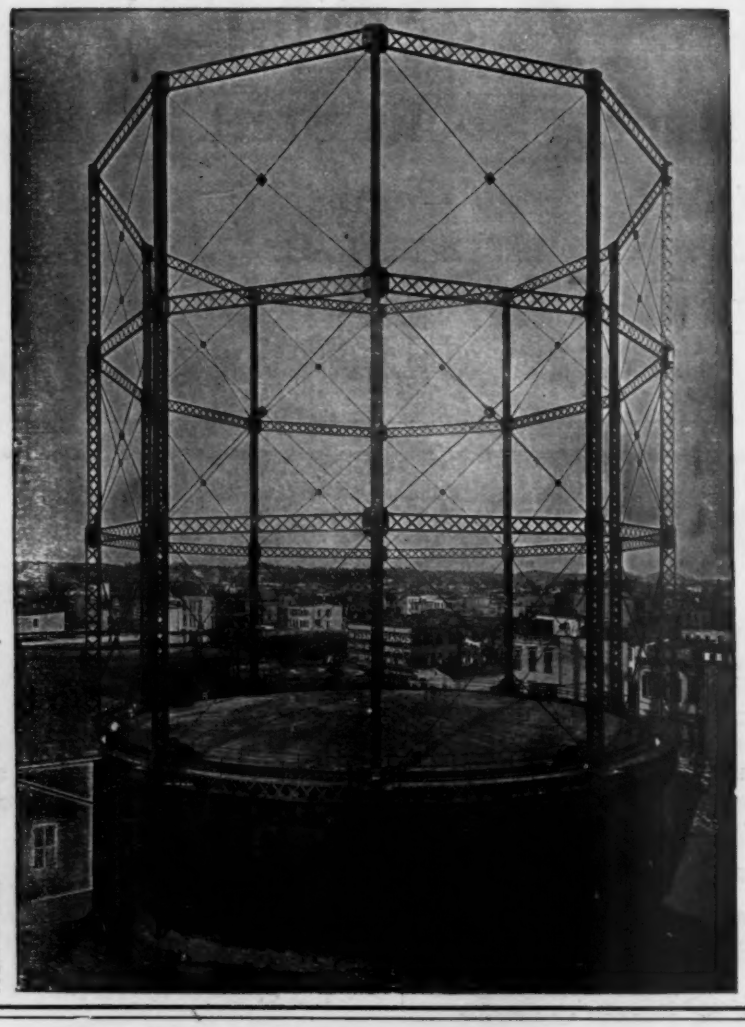

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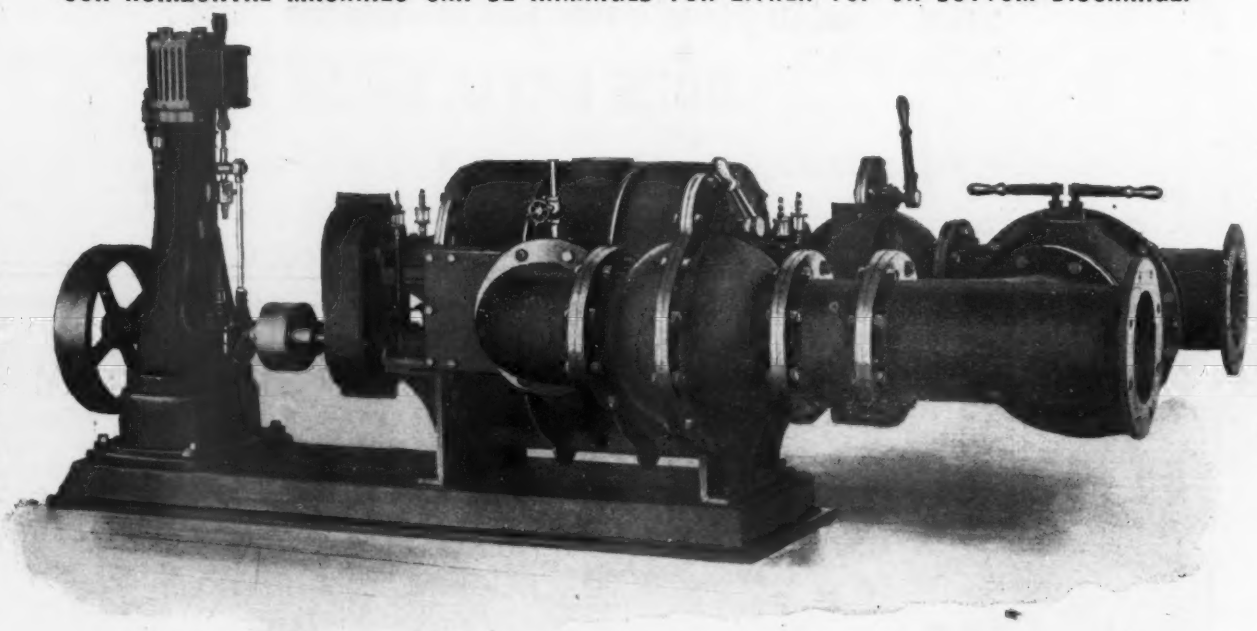

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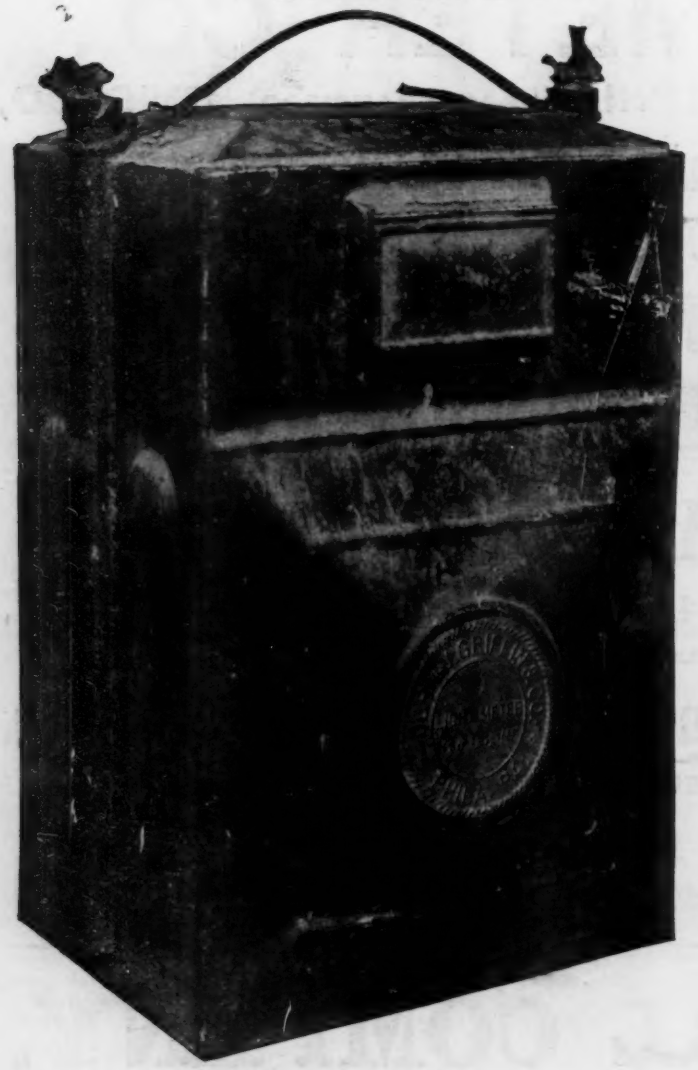

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